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# **Massachusetts Births 2002**

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# Table of Contents

## Massachusetts Births 2002

Page

### Executive Summary

### Chapter 1: Birth Characteristics

18	Table 1.	Trends in Birth Characteristics, 1980, 1985, 1990-2002
19	Table 2A.	Birth Characteristics by Maternal Race and Hispanic Ethnicity, 2002
20	Table 2B.	Birth Characteristics by Maternal Ancestry, 2002
21	Table 3A.	Resident Birth Characteristics, 30 Largest Municipalities, 2002
23	Table 3B.	Resident Birth Characteristics, Community Health Network Areas, 2002
25	Table 4.	Age-Specific and Crude Birth Rates, 1990 and 2002
26	Figure 1.	Trends in the Number of Births by Mother's Age Group, 1980-2002
27	Figure 2.	Percent of Mothers Breastfeeding or Intending to Breastfeed by Age Group, 2002
28	Figure 3.	Smoking Prevalence during Pregnancy by Mother's Education and Race/ Hispanic Ethnicity, 2002
29	Figure 4.	The Distribution of Smoking Status during Pregnancy by Smoking Status Prior to Pregnancy, 2002
30	Table 5.	Parity by Age of Mother, 2002
31	Table 6.	Trends in Number and Percentage Distribution of Births by Plurality and Age, 1990-2002
32	Table 7.	Selected Birth Characteristics by Maternal Education, 2002
33	Table 8.	Comparison of Massachusetts Perinatal Health Indicators to Healthy People 2010 Objectives

### Chapter 2: Teen Birth Characteristics

40	Table 9.	Summary of Selected Teen Birth Characteristics, 2002
41	Figure 5.	Comparison of Teen vs. Adult Births, Selected Characteristics, 2002
42	Figure 6.	Trend in Birth Rates among Women Ages 15-19, Massachusetts and the United States: 1985-2002
43	Figure 7.	Birth Rates among Women Ages 15-19 by Race/Hispanic Ethnicity, 1990 and 2002
44	Table 10.	Resident Teen Birth Characteristics, 30 Largest Municipalities, 2002
46	Table 11.	Trends in Teen Birth Rates for Selected Communities, 2002, 2001, and 1992

### Chapter 3: Infant and Maternal Mortality

51	Table 12A.	Trends in Infant, Neonatal, and Post Neonatal Mortality by Race, 1980-2002
54	Table 12B.	Trends in Infant, Neonatal, and Post Neonatal Mortality by Race and Hispanic Ethnicity, 1990-2002
56	Figure 8.	Infant Mortality Rates and 95% Confidence Intervals by Race, 1980-2002
57	Figure 9.	Infant Mortality Rates, 1842-2002
58	Figure 10.	Trends in the Timing of Infant Deaths, 1990-2002
59	Figure 11.	Trends in Pregnancy-Associated and Maternal Mortality, 1990-2002

#### **Chapter 4: Birthweight and Gestational Age**

- 65 Table 13. Births by Birthweight, Race and Hispanic Ethnicity, 2002
- 66 Figure 12. Low Birthweight among Smoking and Nonsmoking Mothers by Race and Hispanic Ethnicity, 2002
- 67 Table 14. Low Birthweight by Maternal Age, Race and Hispanic Ethnicity, 2002
- 68 Table 15. Low Birthweight by Plurality, Massachusetts: 1992-2002
- 69 Table 16. Births by Gestational Age, Race and Hispanic Ethnicity, 2002

#### **Chapter 5: Adequacy of Prenatal Care**

- 76 Figure 13. Trends in Adequacy of Prenatal Care by Race and Hispanic Ethnicity, 1996-2002
- 77 Table 17. Adequacy of Prenatal Care by Selected Characteristics, 2002
- 78 Figure 14. Adequacy of Prenatal Care for Selected Population Characteristics, 2002
- 79 Table 18. Adequacy of Prenatal Care by Selected Maternal and Infant Characteristics, 2002
- 80 Table 19. Adequacy of Prenatal Care Initiation by Selected Maternal and Infant Characteristics, 2002
- 81 Table 20. Adequacy of Prenatal Care Visits by Selected Maternal and Infant Characteristics, 2002

#### **Chapter 6: Prenatal Care Source of Payment**

- 87 Figure 15. Distribution of Prenatal Care Payment Source, 2002
- 88 Table 21. Birth Characteristics by Prenatal Care Payment Source, Race, and Hispanic Ethnicity, 2002

#### **Chapter 7: Cesarean Section Deliveries by Hospital**

- 96 Table 22. Cesarean Section Deliveries and Vaginal Births after Cesarean Section (VBACs) by Licensed Maternity Facility, All Births, 2002
- 98 Table 23. Cesarean Section Deliveries for Singleton Births by Licensed Maternity Facility and Number of Previous Births, 2002

#### **Chapter 8: Births by Hospital and Community**

- 104 Table 24. Birth Characteristics by Licensed Maternity Facility, 2002
- 105 Table 25A. Birth Characteristics by Massachusetts Municipalities, 2002
- 114 Table 25B. Birth Characteristics by County, 2002
- 115 Table 25C. Birth Characteristics by Community Health Network Areas, 2002

### **Appendix**

- 119 Technical Notes
- 123 Confidence Intervals and Infant Mortality Rates
- 125 Definition of Rates
- 128 2000 Population Estimates for Cities, Towns, Counties, and Community Health Network Areas
- 132 Glossary
- 137 Massachusetts Sample Birth Certificate
- 139 *Massachusetts Births 2002* Evaluation Form

## **EXECUTIVE SUMMARY**



## 2002 Highlights

- **The teen birth rate continues its steady decline of the last twelve years.** The Massachusetts teen birth rate has decreased steadily from 35.4 births per 1,000 women ages 15-19 in 1990 to 22.6 in 2002; the lowest teen birth rate in the last 3 decades.
- **The infant mortality rate (IMR) in 2002 was 4.9 infant deaths per 1,000 live births, compared with 5.0 in 2001.** The year 2002 had the **second lowest number of infant deaths in Massachusetts's history.**
- **The Cesarean section delivery rate continues to increase in Massachusetts as well as throughout the United States.** In 2002, 28.2% of all births to Massachusetts residents were delivered by c-section, the highest rate ever reported in the state. This is a 10% increase from the 2001 c-section rate. Since 1997, c-section rates have increased by an average of 7% per year.
- **The percentage of women smoking during pregnancy decreased** from 9.1% in 2001 to 7.9% in 2002, **continuing its steady decline from the last decade.** The rate of smoking during pregnancy has decreased 59% since 1990 (19.3%).
- **The percentage of low birthweight infants (less than 2,500 grams or 5.5 pounds) increased to 7.5% in 2002, the highest since at least 1980.** Since 1990, the percentage of low birthweight infants has increased by 29%, from 5.8% in 1990 to 7.5% in 2002. The increase in low birth weight infants can be linked directly to the increase in multiple births and the aging of the population giving birth.
- **The percentage of preterm infants (delivered before the 37<sup>th</sup> week of gestation) increased 6% from 8.0% in 2001 to 8.5% in 2002.**
- **The twelve-year trend of increasing numbers of multiple births continues.** The percentage of multiple births increased from 4.4% of births in 2001 to 4.9% in 2002. The percentage of multiple births in Massachusetts has increased 89% since 1990 (2.6%).
- **The age of birth mothers in Massachusetts continues to increase.** In 1980, 1 out of 4 Massachusetts mothers were ages 30 and over, now more than 1 in 2 (57%).
- **In Massachusetts, the average age at first birth was 28.0 years** in 2002 compared with 25.1 years for the United States, which was an all time high.
- Despite a very small percent (less than 1%) decrease in overall births from 2001, certain groups have experienced large increases in the numbers of births. **Five groups have increased more than 10%: Asian Indians, Brazilians, Chinese, Africans, and Vietnamese.**

## Number and Rate of Births

**The number of births to Massachusetts residents declined by about 0.5% between 2001 and 2002**, from 81,014 to 80,624. Since 1990, the number of births in Massachusetts has declined by 13%, and the birth rate among women of reproductive age has declined by 9%

(from 62.1 to 56.5 births per 1,000 females ages 15-44). **The average age at first birth was 28.0 years** in 2002 compared with 27.7 years in 1999.

### Infant Mortality

**The infant mortality rate (IMR) in 2002 was 4.9 infant deaths per 1,000 live births, compared with 5.0 in 2001.** There were a total of 397 infant deaths in 2002, compared with 407 in 2001. The infant mortality rate has decreased 29% since 1990, from 7 deaths per 1,000 live births to 4.9 deaths per 1,000 live births.

**Infants born to black non-Hispanic mothers continued to have the highest IMR** (11.6 per 1,000 live births), although this was slightly lower than the 2001 rate (12.1). 2002 IMR rates for infants of Hispanic mothers and for infants of Asian mothers were slightly lower than in 2001, while rates remained the same for infants born to white non-Hispanic mothers.

### Pregnancy-Associated and Maternal Mortality Ratios

**In 2002, there were 19 pregnancy-associated deaths, including 2 maternal deaths in Massachusetts.** The 2002 pregnancy-associated mortality ratio (PAMR) was 23.3 deaths per 100,000 live births and the maternal mortality ratio (MMR) was 2.4 per 100,000 live births. Since 1990, the annual PAMR fluctuated from a low of 18.0 in 1990 to a high of 32.8 in 2001. However, due to the small number of cases, the differences are not statistically significant.

*(Note: A “pregnancy-associated death” is the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. A “maternal death” is the death of a woman while pregnant or within 42 days of pregnancy, the cause of which is related to the pregnancy or its management. See Glossary for further information).*

### Teen Births

**Births to women ages 15-19 decreased between 2001 and 2002**, from a total of 4,979 births to 4,642 births. The rate in 2002 was 22.6 births per 1,000 females ages 15-19, a 7% decrease from the 2001 rate of 24.3. The teen birth rate in Massachusetts has declined by 31% since 1990.

**The low birthweight percentage among births to teen mothers was 10.3% in 2002**, compared with 7.4% among births to mothers ages 20 and older in 2002.

Among Massachusetts municipalities in 2002 with the highest number of teen births, **teen birth rates were highest in Holyoke** (82.0 per 1,000 females ages 15-19), **Chelsea** (81.7), **Lawrence** (79.7), **Springfield** (70.1), and **New Bedford** (58.8).

### Low Birthweight

**The percentage of low birthweight infants (less than 2,500 grams or 5.5 pounds) increased to 7.5% in 2002 (from 7.2% in 2001).** Since 1990, the percentage of low birthweight infants has increased by 29%, from 5.8% in 1990.



Between 2001 and 2002, the percentage of low birthweight infants increased by 3% for white non-Hispanics (6.6% to 6.8%), by 13% for black non-Hispanics (11.2% to 12.6%), by 10% for Asians (7.3% to 8.0%), and by 1% for Hispanics (8.2% to 8.3%).

Between 2001 and 2002, the percentage of low birthweight infants increased slightly among singletons (5.1% to 5.2%) and among multiple births (52% to 53%).

Very low birthweight (VLBW; infants weighing less than 3.3 pounds) has remained stable at 1.4% since 1999. For the third year in a row, black non-Hispanic infants continue to have the highest percentage of VLBW, experiencing a small decrease from 3.2% in 2001 to 3.1% in 2002.

### Preterm Deliveries

**The percentage of preterm infants (delivered before the 37<sup>th</sup> week of gestation) increased 6% from 8.0% in 2001 to 8.5% in 2002.** Preterm rates increased for all race and Hispanic ethnicity groups, but increases were greatest for Asians (a 21% increase; from 6.3% to 7.6%) and Hispanics (a 7% increase; from 8.3% to 8.9%). Black non-Hispanic women had the highest proportion of preterm infants.

Less than a quarter of a percent (0.2%) of births had gestational age of less than 24 weeks, about the same since at least 1994. **The percentage of infants delivered very early (before the 28<sup>th</sup> week of gestation) has remained the same since 1997 at 0.6%.** Black non-Hispanic women had the highest proportion of infants delivered very early, 1.7%, which was more than double that of any other race group.

### Births by Race, Hispanic Ethnicity, and Mother's Birthplace

The percentage of births to white non-Hispanic and black non-Hispanic mothers has decreased since 1990. From 1990 to 2002, it decreased by 8%, from 78.4% to 72.1% for white non-Hispanic mothers, and by 4% for black non-Hispanic mothers, from 7.7% to 7.4%. The percentage of births to Asian mothers increased by 78%, from 3.7% to 6.6%. The percent of births to Hispanic mothers increased by 30%, from 9.1% to 11.8%.

The percentage of births to non-U.S.-born mothers increased 6% between 2001 and 2002 – from 22.1% to 23.3%. **In 2002, more than 1 of every 5 births to Massachusetts residents was to a mother born outside the continental U.S., Puerto Rico, and the U.S. Territories.**

### Smoking

**The percentage of women who smoked during pregnancy decreased from 9.1% in 2001 to 7.9% in 2002.** Decreases in smoking during pregnancy occurred among all races and Hispanic ethnicity groups.

### Prenatal Care

**Adequacy of prenatal care decreased by less than 1% from 85.2% in 2001 to 84.7% in 2002.** Adequacy of prenatal care is a measure of the timing and number of prenatal care visits,

not an assessment of the quality of prenatal care. [Please note: these data are not comparable to data published in reports prior to 2001. Beginning with last year's report, the Adequacy of Prenatal Care Utilization (APNCU) Index is used to measure adequacy of prenatal care, replacing the Kessner Index. Please see Chapter 5 for more detail.]

### Cesarean Sections

**The Cesarean section delivery rate continues to increase.** The cesarean section rate among births to Massachusetts residents was 28.2% in 2002, an increase of 10% from 2001 (25.6%). Increases were among both primary and repeat c-sections. The primary c-section rate increased by 9%, from 18.8% to 20.5%, and the repeat c-section rate increased by 6%, from 80.8% to 85.3%. Accordingly, the rate of vaginal births after cesarean section (VBAC) deliveries decreased substantially, from 19.2% in 2001 to 14.7% in 2002, a decrease of 23%.

### Breastfeeding

**The percentage of mothers breastfeeding or intending to breastfeed increased slightly from 75.3% in 2001 to 76.1% in 2002.** The breastfeeding rate increased for all major race/Hispanic ethnicity groups, but the largest increase between 2001 and 2002 was among Hispanics (4% increase; from 78.1% to 81.0%) followed by black non-Hispanics (2% increase; from 75.8% to 77.0%).

### Public Source of Prenatal Care Payment

The percentage of mothers paying for prenatal care through a public source **increased** between 2001 and 2002, **from 27.8% to 28.5%.**

Mothers whose prenatal care was Medicaid were more likely to be very young mothers, more likely to deliver LBW infants, less likely to receive adequate prenatal care, less likely to breastfeed, more likely to be unmarried, and less likely to receive a Cesarean section than mothers whose prenatal care was privately funded.

### Multiple Births

**The percentage of multiple births (twins, triplets, and higher order) continues to increase; 4.9% of births in 2002 were multiples, compared with 4.4% in 2001.** This percentage has risen steadily since 1990 (2.6%). The percentage of multiples among births to mothers ages 35+ (7.9%) was double the percentage for mothers under age 35 (4.0%).

### Comparison of Massachusetts and U.S. Indicators

**Massachusetts perinatal health indicators in 2002 were generally better than those for the U.S. in 2002.**

According to final U.S. birth statistics for 2002, comparisons were as follows:

- The **birth rate** for women ages 15-44 in Massachusetts (56.5 births per 1,000 women 15-44 years) was **13% lower** than the U.S. birth rate (64.8).

- The **teen birth rate** in Massachusetts (22.6 births per 1,000 women ages 15-19) was **47% lower** than the U.S. teen birth rate (42.9).
- The **low birthweight** rate in Massachusetts (7.5%) was **4% lower** than the U.S. low birthweight rate (7.8%).
- The **preterm** rate in Massachusetts (8.5%) was **29% lower** than the U.S. low birthweight rate (12.1%).
- The **percentage of women receiving prenatal care in the first trimester** in Massachusetts (84.2%) was **slightly higher** than the U.S. percentage (83.8%).
- The **cesarean section delivery rate** in Massachusetts (28.1%) was **8% higher** than the U.S. c-section rate (26.1%).
- **The average age at first birth in 2002 was 28.0 years** compared with the U.S figure of 25.1 years, nationally an all time high.
- According to final U.S. death statistics for 2001, the **infant mortality rate (IMR)** in Massachusetts (4.9) was **28% lower** than the U.S. IMR (6.8).

#### Birth Data Availability

Detailed information on 2002 births in Massachusetts is also available on the Department's free, Internet-based public health information service, **MassCHIP**. To register as a user, visit the MassCHIP website at <http://masschip.state.ma.us> or call 1-888-MASCHIP (within MA only) or (617) 988-3396.

This report is available on the DPH website at: <http://www.state.ma.us/dph/pubstats.htm>.



## **CHAPTER 1**

# **BIRTH CHARACTERISTICS**



## **Birth Numbers and Rates**

In 2002, 80,624 births occurred to Massachusetts residents (Table 1). The number of resident live births in Massachusetts has decreased by 13% since 1990 (92,461 births).

In 2002, the fertility rate was 56.5 births per 1,000 women ages 15-44 years. This rate has decreased by 9% from 1990 and by 0.5% from 2001 (Table 1).

The Massachusetts fertility rate in 2002 was 13% below the U.S. rate of 64.8 per 1,000 women ages 15-44 (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2).

## **Distribution of Births by Race and Hispanic Ethnicity and Mother's Birthplace**

In 2002, of all live births to Massachusetts residents, 72% (58,136) were to white non-Hispanic mothers; 12% (9,543) were to Hispanic mothers; 7% (5,948) were to black non-Hispanic mothers; 7% (5,300) were to Asian mothers; and 2% were to mothers who designated themselves as Indian or other race (Table 2A). The percentage of births to Asian mothers increased by 12% from 2001.

The percentage of births to white non-Hispanic and black non-Hispanic mothers has decreased since 1990. From 1990 to 2002, it decreased by 8%, from 78.4% to 72.1%, and the percentage of births to black non-Hispanic mothers decreased by 4%, from 7.7% to 7.4%. The percentage of births to Asian mothers increased by 78%, from 3.7% to 6.6%. The percent of births to Hispanic mothers increased by 30%, from 9.1% to 11.8% (Table 1).

In 2002, 26% of births in Massachusetts were to women born outside of the continental United States. The percentage of non-U.S.-born (born outside of the U.S. states, Puerto Rico, and U.S. territories) mothers varied by race and ethnicity: 90% of Asian births were to non-U.S.-born women; 46% of Hispanic births were to non-U.S.-born women, and another 21% were to women born in Puerto Rico or other U.S. Territories; and 45% of black non-Hispanic births were to women who were non-U.S.-born (Table 2A).

## **Emerging Populations**

Despite a very small percent (less than 1%) decrease in overall births from 2001, certain groups have experienced large increases in the numbers of births. Five groups have increased more than 10%: Asian Indians, Brazilians, Chinese, Africans, and Vietnamese. Births to Asian Indian mothers have increased by 23% since last year. Births to both Brazilian and Chinese mothers have increased 18% since 2001, and the number of births to African mothers has increased 17%. The number of births to Vietnamese mothers has increased 11% since 2001.

## **Teen Births**

In 2002, there were 4,642 births to women ages 15-19, compared with 4,979 births for this age group in 2001 (Table 1). The number of teen births has steadily decreased since 1990, with an overall decrease of 36% (7,258 teen births in 1990).

The teen birth rate (births per 1,000 women ages 15-19) was 22.6 in 2002, a decrease of 8% from 2001 (24.3) (Table 1). In contrast, the 2002 U.S. teen birth rate was 42.9 (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2), 47% above the Massachusetts teen birth rate.

Teen birth rates in Massachusetts have been decreasing steadily since 1990. The teen birth rate in Massachusetts decreased by 36% from 1990 to 2002 (Table 1).

Statewide, in 2002, 2% of births were to women under age 18, and 6% were to women under the age of 20 (Table 2A). The highest percentage of births to women under 18 among racial and ethnic groups was for Hispanics (6%), followed by black non-Hispanics (4%), Asians (2%), and white non-Hispanics (1%) (Table 2A).

Among maternal ancestry categories, Puerto Ricans and Cambodians had the highest teen birth percentages in 2002. For Puerto Rican women, 24% of births were to women under age 20 and 10% to women under age 18 (Table 2B). For Cambodians, these percentages were 18% and 10%, respectively.

## **Low Birthweight**

In 2002, 7.5% of infants born to Massachusetts women were low birthweight (weighed less than 2,500 grams or 5.5 pounds at birth) (Table 1). This percentage increased 4%, from 7.2% in 2001. This figure was the highest ever recorded in the state.

In 2002, the low birthweight rate in Massachusetts was 4% below the national figure of 7.8%. The percentage of low birthweight births also increased nationwide from 2001 to 2002, from 7.7% to 7.8%, which was the highest in three decades (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2).

The percentage of low birthweight infants varied by mother's race and ethnicity. Black non-Hispanic mothers had the highest proportion of low birthweight infants: 12.6%; followed by Hispanic mothers: 8.3%; Asian mothers: 8.0%; and white non-Hispanic mothers: 6.8% (Table 2A). The low birthweight percentage for black non-Hispanic mothers increased by 13% from 11.2% in 2001 to 12.6% in 2002, and the low birthweight percentage for Asians increased 10% from 7.3% in 2001 to 8.0% in 2002. Percentages for other race groups increased by less than 4%.

In maternal ancestry categories, the highest percentages of low birthweight in 2002 occurred among mothers who identified their ancestries as African-American (13.6%), Cambodian (11.5%), Haitian (12.0%), West Indian/Caribbean (11.6%), and Puerto Rican (10.2%). The highest percentages of very low birthweight (less than 1,500 grams or 3.3 pounds), occurred among mothers who identified their ancestry as: West Indian/Caribbean (3.5%), Haitian (3.4%), and African-American (2.9%) (Table 2B).

## **Prenatal Care**

SPECIAL NOTE ON MEASURING ADEQUACY OF PRENATAL CARE: Beginning with *Massachusetts Births 2001*, adequacy of prenatal care is being measured by the Adequacy of Prenatal Care Utilization (APNCU) Index instead of the Kessner Index, which has been used in



past reports. This improves upon the Kessner Index in various ways, the most important of which is the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to insufficient prenatal care visits.

Table 1 provides a comparison of values based on the two indices between 1996 and 2002. The values for the APNCU Index are consistently higher than those calculated with the Kessner Index. (Table 1). Please see the Technical Appendix for more information on the change from the Kessner Index to the APNCU Index. Please note: adequacy of prenatal care is a measure of the timing and number of prenatal care visits, and does not reflect the quality of care.

In 2002, 84.7% of mothers received adequate prenatal care, decreasing from 85.2% in 2001. Also in 2002, 84.2% of women received prenatal care during the first trimester of pregnancy (Table 2A).

The percentage of adequate prenatal care varied by mother's race and Hispanic ethnicity, ranging from 74.8% for black non-Hispanic mothers to 87.1% for white non-Hispanic mothers. The rates for Hispanic and Asian mothers were 79.0% and 81.9%, respectively (Table 2A).

Adequacy of prenatal care also varied by maternal ancestry. Mothers reporting their ancestries as European, Chinese, and Other Portuguese (not Cape Verdean or Brazilian) were the groups most likely to receive adequate prenatal care – 88.3%, 88.0%, 88.0%, respectively, while Cambodian and Cape Verdean mothers were least likely to receive adequate prenatal care – 62.4% and 69.7%, respectively (Table 2B).

### **Cesarean Section Deliveries**

In 2002, 28.2% of births to resident Massachusetts women were delivered by Cesarean section, which is a 10% increase over the 2001 percentage of 25.6% (Table 2A). The Cesarean section percentage continues to increase; 6% from 1999 (22.4%) to 2000 (23.8%); 8% from 2000 to 2001 (25.6%), and increased 10% from 2001 to 2002 (28.1%). The Cesarean section rate in Massachusetts in 2002 was 8% higher than the nationwide rate of 26.1%. The nationwide rate for 2002 was the highest ever-recorded (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2).

Black non-Hispanic women had the highest percentage of Cesarean section deliveries, at 29.9%, and Asian women had the lowest percentage, at 24.1% (Table 2A). With regard to maternal ancestry, the highest percentage of Cesarean section deliveries occurred among Brazilian women (37.9%) and the lowest percentage among Cambodian women (13.8%) (Table 2B).

### **Breastfeeding**

In 2002, 76.1% of Massachusetts mothers reported that they were breastfeeding or intending to breastfeed their infants (Table 2A). This represents a 35% increase since 1990 (56.6%).

The percentage of mothers breastfeeding differed slightly by maternal race and Hispanic ethnicity, with the highest percentage reported among Hispanics (81.0%) and the lowest among white non-Hispanics (74.7%) (Table 2A). There was more variation among mothers of different self-identified ancestry groups. The highest rates of breastfeeding were among Asian Indians

(95.9%), Brazilians (94.1%), and Salvadorans (93.3%) (Table 2B). In contrast, only 50.2% of women identifying themselves as “Other Portuguese”, and 51.0% of Cambodians reported that they were breastfeeding or intending to breastfeed their infants.

The percentage of mothers breastfeeding or intending to breastfeed increased as mother’s age increased. For teens 15-19, the percentage was 63.3%, while for women ages 45 and above the percentage was highest, at 84.0% (Figure 2).

### **Birth Characteristics in the 30 Largest Massachusetts Cities and Towns**

In 2002, among live births to residents of the 30 largest municipalities in the Commonwealth:

- Crude birth rates (number of births per 1,000 population) were highest in Lawrence (20.0), Lowell (16.5), Lynn (16.4), and Brockton (16.3). The crude birth rates in these cities were 25% or more above the state level (12.7). Crude birth rates were lowest in Newton (9.8) and Barnstable (9.2) (Table 3A).
- Five communities (Springfield, Framingham, Brockton, Pittsfield, and Boston) recorded low birthweight percentages that were at least 25% higher than the statewide average of 7.5% (Table 3A).
- Over 90% of mothers living in Arlington, Brookline, Medford, Newton and Weymouth received adequate prenatal care. In contrast, fewer than 70% of mothers living in Pittsfield (54.6%) and Lowell (68.6%) received adequate prenatal care (Table 3A).
- The birth rate for teens was highest in Lawrence (79.7 births per 1,000 females ages 15 to 19 years) and in Springfield (70.1). These two communities had rates greater than three times the statewide teen rate of 22.6. (Table 3A), although the teen birth rate for Lawrence in 2002 was 16% lower than it was in 2001 (95.2).
- Two communities had 2002 infant mortality rates (IMR) in excess of 10 deaths per 1,000 live births: Haverhill (10.6) and Lawrence (10.1); and the infant mortality rate in Springfield approached 10 at 9.8. Infant mortality rates should be interpreted with caution in these communities since they are based on a small number of infant deaths (Haverhill: 9; Lawrence: 8; and Springfield: 23) (Table 3A).
- Based on a three-year infant mortality rate from 2000-2002, the communities with the highest IMRs were: Worcester (8.9), Lawrence (8.0), and Fall River (8.0) (Table 3A).

### **Birth Characteristics in Community Health Network Areas**

In 2002, among live resident births in the 27 Massachusetts Community Health Network Areas (CHNAs):

- Two CHNAs had crude birth rates of 15 births or more per 1,000 residents: Community Partners for Health (Milford) (15.6) and Greater Lawrence Community Health Network (15.3) (Table 3B).

- More than 8.7% of resident births in four CHNAs were low birthweight -- The Community Health Connection (Springfield), Partners for a Healthier Community (Fall River), Alliance for Community Health (Boston/Chelsea/Revere/Winthrop), and the Greater Brockton Community Health Network (these percentages were 15% or more higher than the statewide average of 7.5%) (Table 3B).
- Less than 70% of mothers received adequate prenatal care in the Community Health Network of Berkshire County (65.4%), while over 90% of mothers living within the Community Health Network North (Beverly/Gloucester), Greater Haverhill Community Health Network, and the Community Health Alliance (Greater Quincy) received adequate prenatal care (Table 3B).
- Teen birth rates among the Community Health Connection (Springfield) and the Greater Lawrence Community Health Network were the highest in the state, approximately double the statewide teen birth rate, while rates were less than one-fourth the statewide average for Greater Woburn/Concord/Littleton Community Health Network, West Suburban Health Network (Newton/Waltham), and Partnership for Health in Hampshire County (Northampton) (Table 3B).
- The Community Health Connection (Springfield) had the highest infant mortality rate in 2002: 8.8 deaths per 1,000 live births. Because of the relatively small number of infant deaths, mortality rates in individual CHNAs should be interpreted with caution (Table 3B).

## **Tobacco Use**

In 2002, 7.9% of births were to mothers who reported smoking cigarettes during their pregnancies (Fig. 3). This represents a 59% decline from 1990 (19.3%), and a decline of 13% from the previous year, 2001 (9.1%).

Smoking prevalence during pregnancy differed by mother's race and Hispanic ethnicity. White non-Hispanic women had the highest prevalence of smoking during pregnancy (8.9%), followed by black non-Hispanic women (7.2%), Hispanic women (6.3%), and, finally, Asian women (1.3%) (Fig. 3).

The prevalence of smoking during pregnancy mostly decreased with higher education levels of the mother; over 21% of mothers with less than a high school education smoked during pregnancy, compared with less than 1% of women with post-college education (Fig. 3). This pattern was the same for white non-Hispanic women, black non-Hispanic women, and Hispanic women.

The majority (85.3%) of women who gave birth in 2002 were non-smokers prior to pregnancy, and 99.9% of them continued to abstain from smoking during pregnancy (Fig. 4). (Fifty-four women started smoking during pregnancy.) Out of the 15% of women who smoked prior to pregnancy, 53% were "light" smokers (1-10 cigarettes daily); 41% were "moderate" smokers (11-20 cigarettes daily); and 7% were "heavy" smokers (21 or more cigarettes daily). Almost half (47%) of pre-pregnancy smokers quit smoking during pregnancy.

## **Patterns in Number and Rate of Births by Age Group**

There has been a marked change in the age distribution of Massachusetts resident mothers since 1980. Approximately 25% of women giving birth were ages 30 years and older in 1980 compared with 57% in 2002. Beginning in 1996, the number of births to mothers aged 30 years and older exceeded the number of births to mothers under age 30. This trend has continued through 2002 (Fig. 1).

In Massachusetts, the fertility rate (births to women ages 15-44 years per 1,000 women ages 15-44) decreased 9% from 1990 (62.2) to 2002 (56.5) (Table 4). In 2002, the age-specific birth rates were highest for 30-34 year old (108.5 per 1,000) and 25-29 year old mothers (83.8 per 1,000). The birth rates for women ages 30 years and older have increased steadily throughout the 1990s (data not shown).

Since 1990, birth rates have increased for every 5-year age group of women ages 30 and above and decreased for every 5-year age group of women under 30 (Table 4). The largest birth rate increases have been for mothers in the oldest age groups, while the largest decreases have been among the youngest age groups (Table 4).

In 2002, there were 73 births to mothers ages 12-14 years (a decrease of 5 births from 2001) and there were 175 births to women 45 years of age or older (an increase of 17%) (Table 4).

## **Plurality**

Plurality is the number of births in one delivery. In 2002, 95.1% of all births were singletons, 4.6% were twins (3,708 births) and 0.3% were triplets (239 births), and one quadruplet. The total percentage of multiple births (twins, triplets or more) was 4.9% in 2002, which was an 11% increase over 2001 (4.4%) (Table 6).

The percentage of multiple births has increased by 89% since 1990 (2.6%) and this increase varies by age. For women under 35 years, the percentage of multiple births increased from 2.5% in 1990 to 4.0% in 2002, an increase of 60%. The percentage of multiple births for women ages 35 years and older has increased at more than double the rate for younger women (126%), from 3.5% in 1990 to 7.9% in 2002 (Table 6).

## **Education**

In 2002, 10% of women who gave birth had less than a high school education; 25% had a high school diploma or GED; 23% had some college education; and 42% had a college degree or more (Table 7).

Maternal educational attainment varied by race and Hispanic ethnicity; 54% of Asian women and 50% of white non-Hispanic women had at least a college degree, compared with 19% of black non-Hispanic women and 10% of Hispanic women (Table 7).

Women with more education were more likely to receive adequate prenatal care; more likely to breastfeed; more likely to have multiple births; and more likely to be married. These mothers

were less likely to smoke during pregnancy and less likely to receive publicly financed prenatal care (Table 7).

### **Healthy People 2010 Objectives**

Healthy People 2010 (HP2010) sets targets for each measurable objective<sup>1</sup>. Table 8 presents the most recent Massachusetts data for HP2010 Maternal, Infant, and Child Health objectives, and measures the state's progress toward meeting the targets set for 2010.

Out of 16 objectives presented, Massachusetts has already met the 2010 target for three indicators: the postneonatal mortality rate, breastfeeding, and maternal mortality ratio. For eight objectives, the 2002 Massachusetts indicators are within 25% of the target goals: infant mortality rate, fetal mortality rate, perinatal mortality rate, preterm birth, early and adequate prenatal care, prenatal care beginning in the first trimester, very low birthweight infants born at Level III hospitals, and smoking during pregnancy. For five objectives, Massachusetts is still more than 25% away from achieving the targets: neonatal mortality rate, low birthweight, very low birthweight, and Cesarean sections (both low-risk women giving birth for the first time and for low-risk women with prior Cesarean section).

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<sup>1</sup> U.S. Department of Health and Human Services. *Tracking Healthy People 2010*. Washington, DC: U.S. Government Printing Office, November 2000.

**Table 1. Trends in Birth Characteristics, Massachusetts: 1980, 1985, 1990-2002**

Characteristic		1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Births<sup>1</sup></b>	<b>n<sup>2</sup></b>	72,591	81,781	92,461	88,176	87,202	84,627	83,758	81,562	80,164	80,321	81,406	80,866	81,582	81,014	80,624
	<b>Rate<sup>3</sup></b>	53.4	57.5	62.1	59.4	59.1	57.6	57.0	55.5	54.6	54.7	55.6	55.9	57.2	56.8	56.5
<b>Race of Mother</b>																
<b>White<sup>4</sup></b>	<b>n</b>	66,220	71,854	80,775	76,983	76,052	73,704	72,980	71,083	69,485	69,503	70,452	69,305	69,371	68,728	67,874
	<b>%<sup>5</sup></b>	91.2	87.9	87.4	87.3	87.2	87.1	87.1	87.2	86.7	86.5	86.5	85.7	85.0	84.8	84.2
<b>Black</b>	<b>n</b>	4,626	5,099	7,729	7,352	7,203	6,916	6,713	6,299	5,946	6,182	6,337	6,524	6,445	6,555	6,649
	<b>%<sup>5</sup></b>	6.4	6.2	8.3	8.3	8.3	8.2	8.0	7.7	7.4	7.7	7.8	8.1	7.9	8.1	8.2
<b>Asian/Other<sup>6</sup></b>	<b>n</b>	1,069	1,741	3,688	3,566	3,582	3,664	3,790	3,817	3,950	4,217	4,248	4,615	5,205	5,279	5,793
	<b>%<sup>5</sup></b>	1.5	2.1	4.0	4.0	4.1	4.3	4.5	4.7	4.9	5.3	5.2	5.7	6.4	6.5	7.2
<b>Unknown</b>	<b>n</b>	676	3,087	269	275	365	343	275	363	783	419	369	422	561	452	308
	<b>%<sup>5</sup></b>	0.9	3.8	0.3	0.3	0.4	0.4	0.3	0.4	1.0	0.5	0.5	0.5	0.7	0.6	0.4
<b>Teen Births (Ages 15-19)</b>	<b>n</b>	7,694	6,859	7,258	6,892	6,555	6,469	6,412	5,990	5,758	5,801	5,823	5,515	5,305	4,979	4,642
	<b>Rate<sup>3</sup></b>	28.1	28.7	35.4	35.4	34.5	34.0	33.2	30.3	28.5	28.5	28.1	26.7	25.8	24.3	22.6
<b>Births to Unmarried Mothers</b>	<b>n</b>	11,356	15,044	22,837	22,852	22,612	22,345	22,302	20,857	20,253	20,640	21,191	21,448	21,621	21,620	21,604
	<b>%</b>	15.6	18.4	24.7	25.9	25.9	26.4	26.6	25.6	25.3	25.7	26.0	26.5	26.5	26.7	26.8
<b>Low Birthweight</b>	<b>n</b>	4,413	4,751	5,388	5,199	5,137	5,202	5,335	5,174	5,105	5,617	5,655	5,708	5,711	5,795	6,060
	<b>%</b>	6.1	5.8	5.8	5.9	5.9	6.2	6.4	6.4	6.4	7.0	7.0	7.1	7.1	7.2	7.5
<b>Preterm</b>	<b>n</b>	6,732	6,009	6,313	6,492	6,438	5,705	5,831	6,117	6,136	5,831	6,117	6,136	6,582	6,412	6,795
	<b>%</b>	7.4	6.8	7.3	7.8	7.9	7.2	7.3	7.6	7.6	7.3	7.6	7.6	8.3	8.0	8.5
<b>Adequate Prenatal Care</b>																
<b>Kessner Index<sup>7</sup></b>	<b>%</b>	82.0	79.4	80.1	81.6	82.9	83.8	84.3	84.2	79.9	80.0	79.8	79.4	79.1	80.4	79.9
	<b>APNCU Index<sup>8</sup></b>									83.3	82.9	82.9	82.9	83.3	85.2	84.7

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Births presented in all tables are resident live births unless otherwise specified.
2. Differences in numbers of births from previous publications are the result of updated files.
3. Birth rates represent the total number of births to women ages 15-44 years per 1,000 females ages 15-44; teen birth rates refer to number of births per 1,000 women age 15-19. 2000-2002 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts. 1999 rates are calculated using the 1999 DPH Massachusetts population estimates (see Technical Notes in Appendix). PLEASE NOTE: DIFFERENCES BETWEEN THESE RATES AND PREVIOUSLY PUBLISHED DATA REFLECT UPDATES IN POPULATION ESTIMATES.
4. On tables and graphs that include data prior to June 1986, the race classifications do not include an ethnicity component; most Hispanics are included in the race category of white.
5. Percentages are calculated based on all births, including those to mothers of unknown race.
6. Other races include American Indian and others not specified.
7. Adequacy of prenatal care in Massachusetts has historically been measured with the Kessner Index, based on the timing of care and number of visits. This measure is calculated based on only those births with known adequacy of prenatal care. Changes in the calculation of the Kessner Index in 1996, as well as computational adjustments made for 1996-2000 data, make data prior to 1996 non-comparable to data from 1996 onward.
8. Beginning with last year's publication, the APNCU Index has replaced the Kessner Index as the standard measurement of adequacy of prenatal care (see Technical Notes for more information).

Table 2A. Birth Characteristics by Maternal Race and Hispanic Ethnicity and Birthplace, Massachusetts: 2002

Race and Hispanic Ethnicity (by mother's birthplace)	Births <sup>1</sup>		Teen Births				Birthweight				Prenatal Care				Cesarean Section		Breastfeeding <sup>5</sup>	
	n	%	<18 Years		<20 Years		Very Low <sup>2</sup>		Low <sup>3</sup>		Adequate <sup>4</sup>		First Trimester		n	%	n	%
<b>State Total</b>	<b>80,624</b>	<b>100.0</b>	<b>1,571</b>	<b>1.9</b>	<b>4,715</b>	<b>5.8</b>	<b>1,109</b>	<b>1.4</b>	<b>6,060</b>	<b>7.5</b>	<b>67,784</b>	<b>84.7</b>	<b>67,457</b>	<b>84.2</b>	<b>22,553</b>	<b>28.1</b>	<b>60,266</b>	<b>76.1</b>
U.S. States / D.C.	59,625	74.0	1,220	2.0	3,615	6.1	782	1.3	4,474	7.5	51,063	86.3	51,378	86.7	16,813	28.3	42,382	72.6
Puerto Rico/U.S. Terr. <sup>7</sup>	2,081	2.6	156	7.5	381	18.3	56	2.7	228	11.0	1,627	78.9	1,551	75.0	487	23.6	1,498	72.7
Non-U.S.-Born <sup>8</sup>	18,825	23.3	194	1.0	715	3.8	266	1.4	1,340	7.1	15,024	80.4	14,456	77.2	5,222	27.8	16,386	87.4
<b>White non-Hispanic</b>	<b>58,136</b>	<b>72.1</b>	<b>598</b>	<b>1.0</b>	<b>2,167</b>	<b>3.7</b>	<b>666</b>	<b>1.1</b>	<b>3,952</b>	<b>6.8</b>	<b>50,347</b>	<b>87.1</b>	<b>50,763</b>	<b>87.8</b>	<b>16,737</b>	<b>28.9</b>	<b>42,458</b>	<b>74.7</b>
U.S. States / D.C.	52,139	89.7	566	1.1	2,019	3.9	600	1.2	3,597	6.9	45,304	87.4	45,873	88.4	14,965	28.8	37,288	73.1
Puerto Rico/U.S. Terr. <sup>7</sup>	40	0.1	3	-- <sup>6</sup>	3	-- <sup>6</sup>	6	15.0	12	30.0	32	84.2	30	76.9	14	35.0	27	81.8
Non-U.S.-Born <sup>8</sup>	5,887	10.1	28	0.5	144	2.4	57	1.0	332	5.6	4,956	84.5	4,803	81.8	1,733	29.5	5,143	87.9
<b>Black non-Hispanic</b>	<b>5,948</b>	<b>7.4</b>	<b>229</b>	<b>3.9</b>	<b>630</b>	<b>10.6</b>	<b>182</b>	<b>3.1</b>	<b>747</b>	<b>12.6</b>	<b>4,370</b>	<b>74.8</b>	<b>4,199</b>	<b>71.4</b>	<b>1,769</b>	<b>29.9</b>	<b>4,540</b>	<b>77.0</b>
U.S. States / D.C.	3,179	53.4	213	6.7	552	17.4	107	3.4	446	14.1	2,404	76.8	2,312	73.4	867	27.4	2,102	66.9
Puerto Rico/U.S. Terr. <sup>7</sup>	25	0.4	0	0.0	2	-- <sup>6</sup>	2	-- <sup>6</sup>	4	-- <sup>6</sup>	19	79.2	17	70.8	10	41.7	22	91.7
Non-U.S.-Born <sup>8</sup>	2,739	46.0	16	0.6	76	2.8	71	2.6	294	10.7	1,944	72.5	1,868	69.2	892	32.7	2,416	88.6
<b>Hispanic</b>	<b>9,543</b>	<b>11.8</b>	<b>607</b>	<b>6.4</b>	<b>1,557</b>	<b>16.3</b>	<b>162</b>	<b>1.7</b>	<b>792</b>	<b>8.3</b>	<b>7,491</b>	<b>79.0</b>	<b>7,155</b>	<b>75.3</b>	<b>2,325</b>	<b>24.5</b>	<b>7,702</b>	<b>81.0</b>
U.S. States / D.C.	3,106	32.5	343	11.0	842	27.1	52	1.7	307	9.9	2,419	78.4	2,323	75.2	691	22.3	2,152	69.7
Puerto Rico/U.S. Terr. <sup>7</sup>	2,009	21.1	153	7.6	376	18.7	48	2.4	212	10.6	1,570	78.7	1,498	75.0	461	23.1	1,444	72.3
Non-U.S.-Born <sup>8</sup>	4,428	46.4	111	2.5	339	7.7	62	1.4	273	6.2	3,502	79.6	3,334	75.5	1,173	26.6	4,106	92.8
<b>Asian</b>	<b>5,300</b>	<b>6.6</b>	<b>80</b>	<b>1.5</b>	<b>206</b>	<b>3.9</b>	<b>76</b>	<b>1.4</b>	<b>424</b>	<b>8.0</b>	<b>4,328</b>	<b>81.9</b>	<b>4,138</b>	<b>78.3</b>	<b>1,275</b>	<b>24.1</b>	<b>4,248</b>	<b>80.5</b>
U.S. States / D.C.	537	10.1	62	11.5	112	20.9	12	2.2	63	11.8	440	82.4	400	74.9	118	22.1	417	78.2
Puerto Rico/U.S. Terr. <sup>7</sup>	2	-- <sup>6</sup>	0	0.0	0	0.0	0	0.0	0	0.0	2	-- <sup>6</sup>	2	-- <sup>6</sup>	1	-- <sup>6</sup>	2	-- <sup>6</sup>
Non-U.S.-Born <sup>8</sup>	4,745	89.5	18	0.4	92	1.9	64	1.3	358	7.5	3,874	81.9	3,724	78.6	1,151	24.3	3,829	80.8
<b>Other<sup>9</sup></b>	<b>1,576</b>	<b>2.0</b>	<b>56</b>	<b>3.6</b>	<b>151</b>	<b>9.6</b>	<b>22</b>	<b>1.4</b>	<b>137</b>	<b>8.7</b>	<b>1,191</b>	<b>76.3</b>	<b>1,143</b>	<b>73.0</b>	<b>421</b>	<b>26.8</b>	<b>1,275</b>	<b>81.9</b>
U.S. States / D.C.	564	35.8	35	6.2	89	15.8	10	1.8	54	9.6	445	79.9	420	75.1	149	26.7	387	69.7
Puerto Rico/U.S. Terr. <sup>7</sup>	3	-- <sup>6</sup>	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0	3	-- <sup>6</sup>	1	-- <sup>6</sup>	2	-- <sup>6</sup>
Non-U.S.-Born <sup>8</sup>	1,009	64.0	21	2.1	62	6.1	12	1.2	83	8.2	743	74.3	720	71.8	271	26.9	886	88.8
<b>Unknown<sup>10</sup></b>	<b>121</b>	<b>0.2</b>	<b>1</b>	<b>--<sup>6</sup></b>	<b>4</b>	<b>--<sup>6</sup></b>	<b>1</b>	<b>--<sup>6</sup></b>	<b>8</b>	<b>9.9</b>	<b>57</b>	<b>79.2</b>	<b>59</b>	<b>80.8</b>	<b>26</b>	<b>31.3</b>	<b>43</b>	<b>70.5</b>

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the first category, "Births", percentages of race/Hispanic ethnicity are based on state total of births (including births of unknown race/ethnicity), percentages of mother's birthplace categories are based on subtotals of each race/Hispanic ethnicity category. For all other categories, percentages are based on row totals. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low birthweight: less than 2,500 grams or 5.5 pounds. 4. Beginning with last year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 5. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed. 6. Calculations based on fewer than five events are excluded. 7. The category "Puerto Rico/U.S. Territories" includes women born in Puerto Rico, the U.S. Virgin Islands, and Guam. Approximately 95% of the births in this category were to women born in Puerto Rico. 8. The category "Non-U.S.-Born" includes women born outside of the 50 U.S. states, District of Columbia, and Puerto Rico/U.S. territories. 9. Other: Mothers who designated themselves as American Indian or Other race. 10. Unknown: Mothers who did not indicate a race/ethnicity.

Table 2B. Birth Characteristics by Maternal Ancestry, Massachusetts: 2002

Maternal Ancestry	Births <sup>1</sup>		Teen Births				Birthweight				Prenatal Care				Cesarean Section		Breastfeeding <sup>5</sup>	
	n	%	<18 Years		<20 Years		Very Low <sup>2</sup>		Low <sup>3</sup>		Adequate <sup>4</sup>		1st Trimester		n	%	n	%
<b>State Total</b>	<b>80,624</b>	<b>100.0</b>	<b>1,571</b>	<b>1.9</b>	<b>4,715</b>	<b>5.8</b>	<b>1,109</b>	<b>1.4</b>	<b>6,060</b>	<b>7.5</b>	<b>67,784</b>	<b>84.7</b>	<b>67,457</b>	<b>84.2</b>	<b>22,553</b>	<b>28.1</b>	<b>60,266</b>	<b>76.1</b>
<b>Puerto Rican</b>	4,487	5.6	432	9.6	1,053	23.5	88	2.0	455	10.2	3,469	77.9	3,321	74.4	1,022	22.9	3,096	69.4
<b>Dominican</b>	1,760	2.2	75	4.3	207	11.8	38	2.2	136	7.7	1,462	83.4	1,412	80.5	508	28.9	1,586	90.3
<b>Salvadoran</b>	853	1.1	27	3.2	82	9.6	7	0.8	40	4.7	655	77.4	580	68.2	159	18.7	796	93.3
<b>Other Central American</b>	842	1.0	30	3.6	97	11.5	11	1.3	53	6.3	641	76.6	610	72.6	189	22.5	769	91.3
<b>Other Hispanic<sup>7</sup></b>	1,601	2.0	43	2.7	118	7.4	18	1.1	108	6.8	1,264	79.4	1,232	77.2	447	28.0	1,455	91.1
<b>Chinese</b>	1,478	1.8	5	0.3	17	1.2	18	1.2	96	6.5	1,296	88.0	1,225	83.2	347	23.5	1,230	83.3
<b>Vietnamese</b>	844	1.0	11	1.3	31	3.7	12	1.4	69	8.2	658	78.5	634	75.3	188	22.3	553	65.6
<b>Cambodian</b>	575	0.7	55	9.6	106	18.4	12	2.1	55	9.6	358	62.4	314	54.7	79	13.8	293	51.0
<b>Asian Indian</b>	1,165	1.4	0	0.0	3	-- <sup>6</sup>	15	1.3	99	8.5	997	85.7	978	84.1	342	29.4	1,116	95.9
<b>Other Asian/PI<sup>8</sup></b>	1,326	1.6	10	0.8	47	3.5	16	1.2	110	8.3	1,089	82.3	1,059	80.0	350	26.5	1,155	87.5
<b>Cape Verdean</b>	790	1.0	30	3.8	91	11.5	9	1.1	67	8.5	544	69.7	505	64.3	200	25.4	612	77.7
<b>Brazilian</b>	1,518	1.9	30	2.0	104	6.9	9	0.6	101	6.7	1,218	80.2	1,187	78.2	575	37.9	1,428	94.1
<b>Other Portuguese</b>	1,435	1.8	29	2.0	108	7.5	12	0.8	106	7.4	1,258	88.0	1,205	84.3	386	26.9	719	50.2
<b>Haitian</b>	1,085	1.3	18	1.7	34	3.1	37	3.4	130	12.0	750	71.0	719	67.3	374	34.6	927	85.6
<b>W. Indian /Carib.<sup>9</sup></b>	636	0.8	8	1.3	43	6.8	22	3.5	74	11.6	483	77.4	455	72.7	192	30.3	546	86.4
<b>African-American</b>	2,827	3.5	175	6.2	470	16.6	83	2.9	384	13.6	2,120	76.2	2,052	73.3	740	26.3	1,896	67.4
<b>African<sup>10</sup></b>	1,113	1.4	1	-- <sup>6</sup>	16	1.4	17	1.5	97	8.7	800	73.0	770	70.1	368	33.2	1,019	91.8
<b>Middle Easterner<sup>11</sup></b>	990	1.2	2	-- <sup>6</sup>	18	1.8	12	1.2	63	6.4	820	83.4	818	83.1	269	27.2	893	90.3
<b>Native American</b>	266	0.3	12	4.5	31	11.7	3	-- <sup>6</sup>	20	7.5	212	80.0	210	79.2	86	32.5	184	69.4
<b>European</b>	15,202	18.9	47	0.3	250	1.6	155	1.0	880	5.8	13,342	88.3	13,303	87.9	4,500	29.7	12,406	82.6

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the first category, "Births", percentages are based on column total (state total of births, including births for which maternal ancestry is unknown and other). For all other categories, percentages are based on row totals. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low birthweight: less than 2,500 grams or 5.5 pounds. 4. Beginning with last year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 5. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed. 6. Calculations based on fewer than five events are excluded. 7. Other Hispanic includes Mexican, Cuban, Colombian, and Other South American. 8. Other Asian and Pacific Islander includes Korean, Filipino, Japanese, Laotian, Thai, Pakistani and Hawaiian. 9. West Indian and Caribbean include Jamaican and Barbadian. 10. African includes Nigerian and other African. 11. Middle Easterner includes Lebanese, Iranian, and Israeli.



Table 3A. Resident Birth Characteristics, 30 Largest Municipalities<sup>1</sup>, Massachusetts: 2002

Municipality	Rank (by pop. size)	Population	Crude Birth Rate <sup>2</sup>	Mother's Race and Ethnicity				Very Low Birthweight (<1500 g)	Low Birthweight (<2500 g)
				White non- Hispanic	Black non- Hispanic	Hispanic	Asian or Other <sup>4</sup>		
				% <sup>3</sup>	% <sup>3</sup>	% <sup>3</sup>	% <sup>3</sup>		
<b>STATE TOTAL</b>		<b>6,349,097</b>	12.7	72.1	7.4	11.8	8.5	1.4	7.5
Arlington	29	42,389	12.9	82.2	1.5	2.6	13.4	0.9	5.9
Attleboro	30	42,068	15.2	83.0	2.8	6.6	7.6	0.9	7.2
Barnstable	25	47,821	9.2	84.6	2.5	5.0	7.7	-- <sup>5</sup>	7.7
Boston	1	589,141	13.6	35.1	30.1	22.9	11.9	2.1	9.5
Brockton	6	94,304	16.3	41.2	31.2	11.5	15.9	1.7	9.7
Brookline	17	57,107	11.4	72.6	2.2	4.3	20.8	1.2	9.3
Cambridge	5	101,355	10.6	57.0	17.6	8.3	16.8	1.6	7.0
Chicopee	21	54,653	11.7	77.6	3.3	16.4	2.7	1.3	8.6
Fall River	8	91,938	12.9	81.5	5.5	7.3	5.5	1.7	9.1
Framingham	14	66,910	14.0	66.6	4.3	15.3	13.8	1.1	9.8
Haverhill	16	58,969	14.4	80.3	3.2	12.1	4.4	1.7	8.4
Lawrence	13	72,043	20.0	19.0	1.9	74.3	4.7	1.5	7.5
Lowell	4	105,167	17.0	47.5	6.7	17.0	28.6	1.8	7.9
Lynn	9	89,050	16.4	40.1	12.6	36.2	11.1	1.4	8.0
Malden	18	56,340	14.4	53.9	12.4	7.4	26.2	1.5	7.1
Medford	20	55,765	11.5	76.1	9.1	4.2	10.6	1.3	7.3
Methuen	28	43,789	13.3	77.2	2.2	15.4	5.1	1.5	8.6
New Bedford	7	93,768	14.1	64.4	7.7	17.8	9.5	1.9	7.8
Newton	11	83,829	9.8	80.9	1.3	3.2	14.6	1.1	6.8
Peabody	24	48,129	10.7	85.2	2.3	7.4	5.1	1.2	8.9
Pittsfield	27	45,793	11.5	86.2	5.3	5.1	3.4	2.5	9.7
Plymouth	23	51,701	13.8	93.3	1.7	1.7	3.2	1.1	8.1
Quincy	10	88,025	13.1	64.6	4.2	2.7	28.4	1.2	6.3
Revere	26	47,283	13.7	61.2	4.6	22.2	11.9	1.2	7.7
Somerville	12	77,478	11.7	59.9	10.7	17.1	12.3	1.5	7.6
Springfield	3	152,082	15.5	33.4	20.8	42.1	3.7	2.2	10.8
Taunton	19	55,976	13.4	83.9	4.4	6.4	5.2	1.5	7.6
Waltham	15	59,226	11.3	61.9	7.1	16.4	14.6	1.5	7.0
Weymouth	22	53,988	13.0	87.7	3.8	1.9	6.1	0.9	7.8
Worcester	2	172,648	15.2	55.0	11.7	22.3	10.9	1.6	7.5

**Table 3A.(cont'd) Resident Birth Characteristics, 30 Largest Municipalities<sup>1</sup>, Massachusetts: 2002**

Municipality	Birth					Deaths			
	Adequate Prenatal Care <sup>6</sup>	Public Payment <sup>7</sup> for Prenatal Care	Unmarried	Teen Mothers 15 to 19 years		Infant Mortality Rate <sup>8</sup>		Neonatal Mortality Rate <sup>8</sup>	
	%	%	%	n	Rate <sup>2</sup>	2002	2000-2002	2002	2000-2002
STATE TOTAL	84.7	28.5	26.8	4,642	22.6	4.9	4.8	3.7	3.7
Arlington	91.0	5.0	7.7	5	6.5	-- <sup>5</sup>	-- <sup>5</sup>	-- <sup>5</sup>	-- <sup>5</sup>
Attleboro	78.2	23.2	22.5	32	27.8	-- <sup>5</sup>	2.6	-- <sup>5</sup>	2.6
Barnstable	87.1	39.9	27.4	35	27.2	-- <sup>5</sup>	6.4	-- <sup>5</sup>	3.5
Boston	83.3	48.0	44.1	664	29.9	7.0	7.0	5.1	5.3
Brockton	74.7	56.9	51.0	163	49.3	5.9	5.6	5.9	4.5
Brookline	94.1	6.5	6.2	5	3.6	7.7	2.7	7.7	2.7
Cambridge	88.2	16.2	16.8	24	6.4	6.5	4.8	4.7	2.5
Chicopee	81.8	47.6	44.6	60	33.2	-- <sup>5</sup>	4.4	-- <sup>5</sup>	3.8
Fall River	85.1	61.4	50.9	158	54.2	6.7	8.0	6.7	7.5
Framingham	89.2	27.5	18.6	41	21.3	5.3	6.5	-- <sup>5</sup>	5.4
Haverhill	89.7	28.4	30.2	67	37.4	10.6	5.8	9.4	5.4
Lawrence	86.9	63.8	62.6	227	79.7	5.6	8.0	3.5	5.7
Lowell	68.6	50.5	46.3	228	58.3	10.1	7.0	6.1	5.3
Lynn	79.2	57.4	44.5	162	54.2	6.2	6.7	5.5	5.3
Malden	83.5	35.1	22.5	25	18.0	-- <sup>5</sup>	3.7	-- <sup>5</sup>	2.1
Medford	90.8	19.5	19.4	10	5.7	-- <sup>5</sup>	3.2	-- <sup>5</sup>	3.2
Methuen	87.8	22.8	25.3	26	20.6	-- <sup>5</sup>	5.8	-- <sup>5</sup>	5.8
New Bedford	76.9	60.4	57.7	175	58.8	7.6	6.6	-- <sup>5</sup>	3.3
Newton	91.0	4.8	4.4	9	2.6	-- <sup>5</sup>	3.9	-- <sup>5</sup>	2.8
Peabody	85.9	20.9	16.7	10	7.7	-- <sup>5</sup>	6.8	0.0	4.9
Pittsfield	54.6	46.1	44.5	61	44.8	-- <sup>5</sup>	4.7	0.0	-- <sup>5</sup>
Plymouth	79.4	16.8	14.3	22	14.0	-- <sup>5</sup>	4.3	-- <sup>5</sup>	2.4
Quincy	89.7	25.7	17.9	31	15.9	5.2	4.4	-- <sup>5</sup>	3.5
Revere	84.5	43.0	33.4	51	42.0	-- <sup>5</sup>	4.1	-- <sup>5</sup>	3.6
Somerville	81.8	32.5	26.1	50	24.0	-- <sup>5</sup>	3.7	-- <sup>5</sup>	3.0
Springfield	73.5	66.7	64.3	423	70.1	9.8	7.3	6.8	4.4
Taunton	80.4	36.4	37.6	57	34.5	8.0	7.3	6.6	5.6
Waltham	83.5	23.1	21.9	24	10.7	-- <sup>5</sup>	4.4	-- <sup>5</sup>	2.9
Weymouth	91.4	16.3	16.1	21	15.8	-- <sup>5</sup>	3.2	-- <sup>5</sup>	3.2
Worcester	77.6	39.9	42.1	226	32.7	8.8	8.9	6.1	6.6

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. The 30 largest municipalities are the cities and towns in Massachusetts with the largest populations according to DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 2. Crude birth rates represent the number of births per 1,000 residents; teen birth rates refer to the number of births per 1,000 females ages 15-19. 2002 birth rates are calculated using the DPH 2000 population estimates. 3. For the category of Mother's Race and Ethnicity, percentages are calculated based on the state total of resident births, including births for which mother's race/Hispanic ethnicity is unknown. 4. Mothers who designated themselves as Asian, American Indian or Other. 5. Calculations based on fewer than 5 events are excluded. 6. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary for definition. 7. Public payment sources include Commonwealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care. 8. Deaths per 1,000 live births. See Definitions of Rates section in Appendix for definitions of infant and neonatal mortality rates.

**Table 3B: Resident Birth Characteristics, Community Health Network Areas (CHNAs), Massachusetts: 2002**

CHNA	Population	Crude Birth Rate <sup>1</sup>	Mother's Race and Ethnicity				Very Low Birthweight (<1500 g) %	Low Birthweight (<2500 g) %
			White non-Hispanic % <sup>3</sup>	Black non-Hispanic % <sup>3</sup>	Hispanic % <sup>3</sup>	Asian or Other <sup>2</sup> % <sup>3</sup>		
<b>STATE TOTAL</b>	6,349,097	12.7	72.1	7.4	11.8	8.5	1.4	7.5
Community Health Network of Berkshire County	134,953	9.2	89.7	2.9	4.2	3.1	1.9	7.6
Upper Valley Health Web (Franklin County)	86,889	9.3	91.7	1.2	3.9	2.6	1.4	6.9
Partnership for Health in Hampshire County (Northampton)	150,077	8.5	86.3	1.3	6.3	5.9	1.7	5.9
The Community Health Connection (Springfield)	291,665	12.9	55.0	13.5	27.8	3.7	1.9	9.3
Community Health Network of Southern Worcester County	113,702	12.3	88.2	1.4	8.0	2.1	1.2	7.6
Community Partners for Health (Milford)	152,117	15.6	92.9	1.1	2.5	3.5	1.2	7.2
Community Health Network of Greater Metro West (Framingham)	374,478	14.1	83.4	1.6	5.6	9.2	1.3	7.3
Community Wellness Coalition (Worcester)	289,834	13.9	66.3	8.1	15.2	10.4	1.3	6.7
Fitchburg/Gardner Community Health Network	250,362	12.6	82.1	2.9	10.8	4.0	1.1	7.0
Greater Lowell Community Health Network	270,083	14.6	69.9	3.5	8.5	18.1	1.3	7.4
Greater Lawrence Community Health Network	182,025	15.3	50.1	1.6	42.3	5.9	1.3	6.7
Greater Haverhill Community Health Network	144,275	13.7	89.2	1.8	6.1	2.9	1.5	8.4
Community Health Network North (Beverly/Gloucester)	118,280	10.7	91.5	0.7	3.5	4.2	0.4	6.3
North Shore Community Health Network	278,839	12.7	67.8	6.1	19.0	7.1	1.3	7.6
Greater Woburn/Concord/Littleton Community Health Network	208,406	11.9	81.1	2.2	2.7	13.7	1.1	6.6
North Suburban Health Alliance (Medford/Malden/Melrose)	261,844	13.1	75.9	6.6	6.7	10.8	1.3	7.5
Greater Cambridge/Somerville Community Health Network	278,402	11.3	67.5	9.7	8.9	13.7	1.3	6.9
West Suburban Health Network (Newton/Waltham)	253,187	11.2	80.9	2.6	5.8	10.7	1.1	6.2
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	746,914	13.5	39.2	24.7	24.1	11.9	1.8	9.0
Blue Hills Community Health Alliance (Greater Quincy)	365,457	12.9	77.8	5.9	2.3	13.6	1.3	7.1
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	159,254	12.1	67.5	2.6	27.7	2.1	1.4	8.4
Greater Brockton Community Health Network	232,260	13.6	65.8	17.3	6.7	9.9	1.6	8.7
South Shore Community Partners in Prevention (Plymouth)	180,609	13.5	95.3	1.1	0.9	2.6	0.9	6.6
Greater Attleboro-Taunton Health & Education Response	242,659	13.8	90.0	2.2	3.2	4.4	1.1	6.8
Partners for a Healthier Community (Fall River)	140,256	11.2	85.3	4.1	5.8	4.6	1.5	9.1
Greater New Bedford Health & Human Services Coalition	195,533	12.0	76.6	5.5	10.4	7.2	1.3	7.2
Cape and Islands Community Health Network	246,737	9.3	88.0	2.8	3.4	5.5	1.4	6.5

**Table 3B.(cont'd) Resident Birth Characteristics, Community Health Network Areas (CHNAs), Massachusetts: 2002**

CHNA	Births					Deaths			
	Adequate Prenatal Care <sup>6</sup> %	Public Payment <sup>7</sup> for Prenatal Care %	Unmarried %	Teen Mothers 15 to 19 years		Infant Mortality Rate <sup>8</sup>		Neonatal Mortality Rate <sup>8</sup>	
				n	Rate <sup>4</sup>	2002	2000-2002	2002	2000-2002
<b>STATE TOTAL</b>	84.7	28.5	26.8	4,642	22.6	4.9	4.8	3.7	3.7
Community Health Network of Berkshire County	65.4	42.2	40.3	126	26.7	5.6	4.1	4.0	2.2
Upper Valley Health Web (Franklin County)	83.6	37.7	34.6	73	25.5	0.0	2.7	0.0	2.3
Partnership for Health in Hampshire County (Northampton)	88.0	23.8	27.3	49	5.4	7.0	5.0	4.7	3.7
The Community Health Connection (Springfield)	78.6	50.1	46.9	467	44.4	8.8	5.9	5.9	3.7
Community Health Network of Southern Worcester County	83.8	27.3	30.3	88	24.0	5.7	4.0	4.3	2.6
Community Partners for Health (Milford)	89.9	10.9	12.6	65	14.4	5.5	5.8	4.6	4.8
Community Health Network of Greater Metro West (Framingham)	89.4	12.0	10.5	117	11.8	3.6	4.4	2.8	3.8
Community Wellness Coalition (Worcester)	78.8	28.8	31.5	261	25.2	7.5	7.0	5.7	5.4
Fitchburg/Gardner Community Health Network	83.1	26.6	27.8	208	25.4	4.8	4.2	3.2	2.9
Greater Lowell Community Health Network	77.2	27.8	27.7	273	31.8	5.3	4.5	3.3	3.4
Greater Lawrence Community Health Network	88.2	38.8	39.2	258	41.3	3.9	5.7	2.9	4.5
Greater Haverhill Community Health Network	91.7	18.2	20.5	91	21.6	7.1	4.5	6.1	3.6
Community Health Network North (Beverly/Gloucester)	91.8	18.5	15.4	37	9.9	-- <sup>5</sup>	3.1	-- <sup>5</sup>	2.4
North Shore Community Health Network	83.4	33.5	28.3	212	25.6	3.9	5.1	3.1	4.0
Greater Woburn/Concord/Littleton Community Health Network	87.6	6.3	6.8	22	4.1	2.4	2.8	-- <sup>5</sup>	2.1
North Suburban Health Alliance (Medford/Malden/Melrose)	87.8	21.2	16.3	77	11.1	2.6	3.0	2.0	2.3
Greater Cambridge/Somerville Community Health Network	87.4	18.0	16.0	87	11.0	3.8	4.4	2.5	3.0
West Suburban Health Network (Newton/Waltham)	89.3	9.1	8.6	42	4.3	2.8	2.9	2.8	2.1
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	84.0	45.2	41.1	814	30.9	6.5	6.3	4.8	4.8
Blue Hills Community Health Alliance (Greater Quincy)	91.5	15.3	13.7	101	10.5	4.2	3.2	3.6	2.7
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	82.1	50.2	46.5	226	38.4	5.2	5.4	5.2	4.4
Greater Brockton Community Health Network	82.3	34.8	33.9	207	25.0	4.1	4.9	3.8	4.2
South Shore Community Partners in Prevention (Plymouth)	87.9	13.4	12.8	58	10.3	-- <sup>5</sup>	3.1	-- <sup>5</sup>	2.0
Greater Attleboro-Taunton Health & Education Response	81.7	21.1	21.1	148	19.4	4.5	4.4	4.2	3.7
Partners for a Healthier Community (Fall River)	86.6	53.5	42.7	173	39.0	6.3	7.9	6.3	7.3
Greater New Bedford Health & Human Services Coalition	76.8	44.6	43.7	237	36.3	6.0	6.0	3.0	3.4
Cape and Islands Community Health Network	86.3	32.6	24.0	125	20.3	5.2	5.8	3.5	4.2

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Births per 1,000 residents (male and female). 2002 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 2. Mothers who designated themselves as Asian, American Indian or Other. 3. For the category of Mother's Race and Ethnicity, percentages are calculated based on the state total of resident births, including births for which mother's race/Hispanic ethnicity is unknown. 4. Births per 1,000 female residents ages 15-19. 5. Calculations based on fewer than 5 events are excluded. 6. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary for definition. 7. Public payment sources include Commonwealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care. 8. Deaths per 1,000 live births. See Definitions of Rates section in Appendix for definitions of infant and neonatal mortality rates.

**Table 4. Age-Specific and Crude Birth Rates, Massachusetts: 1990 and 2002**

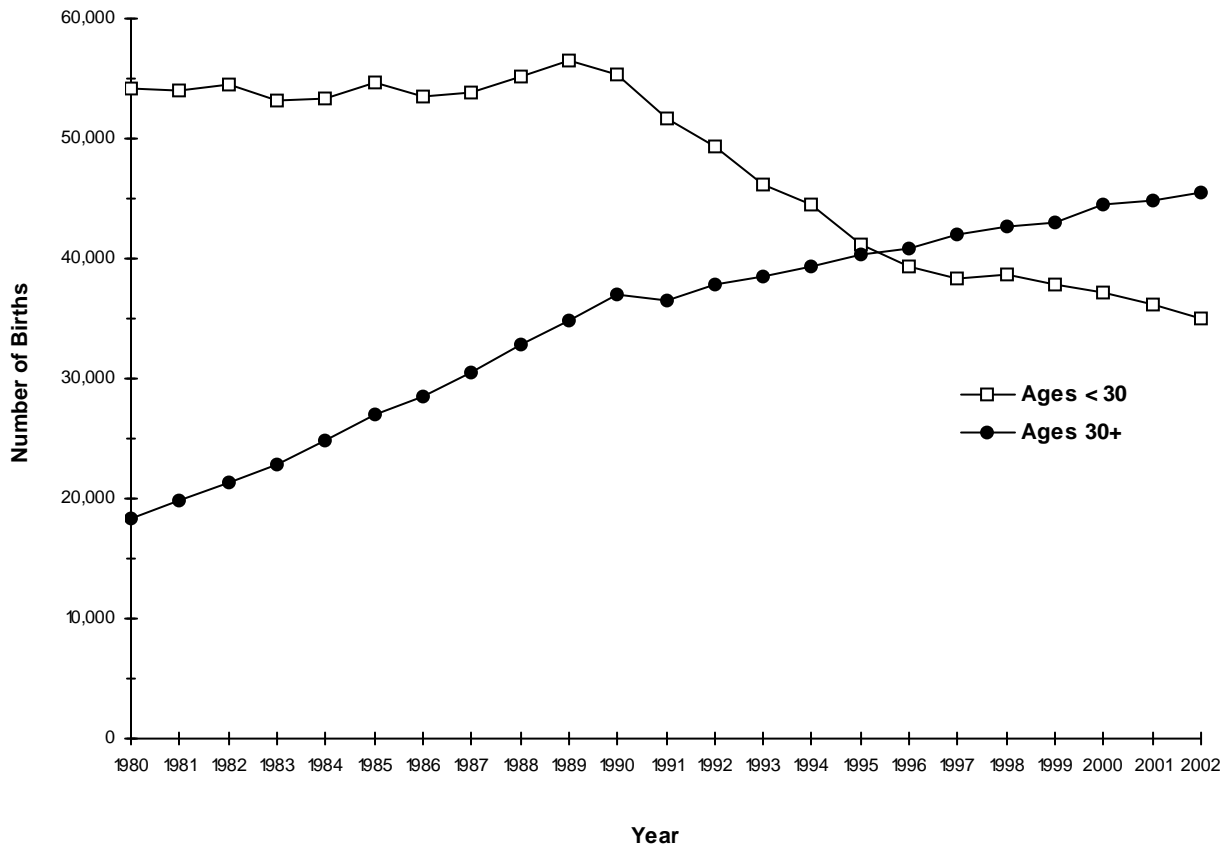
Mother's Age	1990		2002		Percent Change in Rate
	Births <sup>1</sup>	Rate	Births	Rate <sup>2</sup>	
12-14	124	1.3	73	0.6	-53.8
15-19	7,258	35.8	4,642	22.6	-36.9
20-24	18,115	70.5	11,880	57.8	-18.0
25-29	29,913	107.5	18,484	83.8	-22.0
30-34	25,687	92.1	27,163	108.5	17.8
35-39	9,795	40.1	15,121	55.2	37.7
40-44	1,522	6.9	3,085	11.6	68.1
45+ <sup>3</sup>	46	0.3	175	0.7	133.3
Birth rate, ages 15-44 <sup>4</sup>	92,290	62.2	80,375	56.5	-9.2
Crude Birth Rate <sup>5</sup>	92,461	15.4	80,624	12.7	-17.5

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

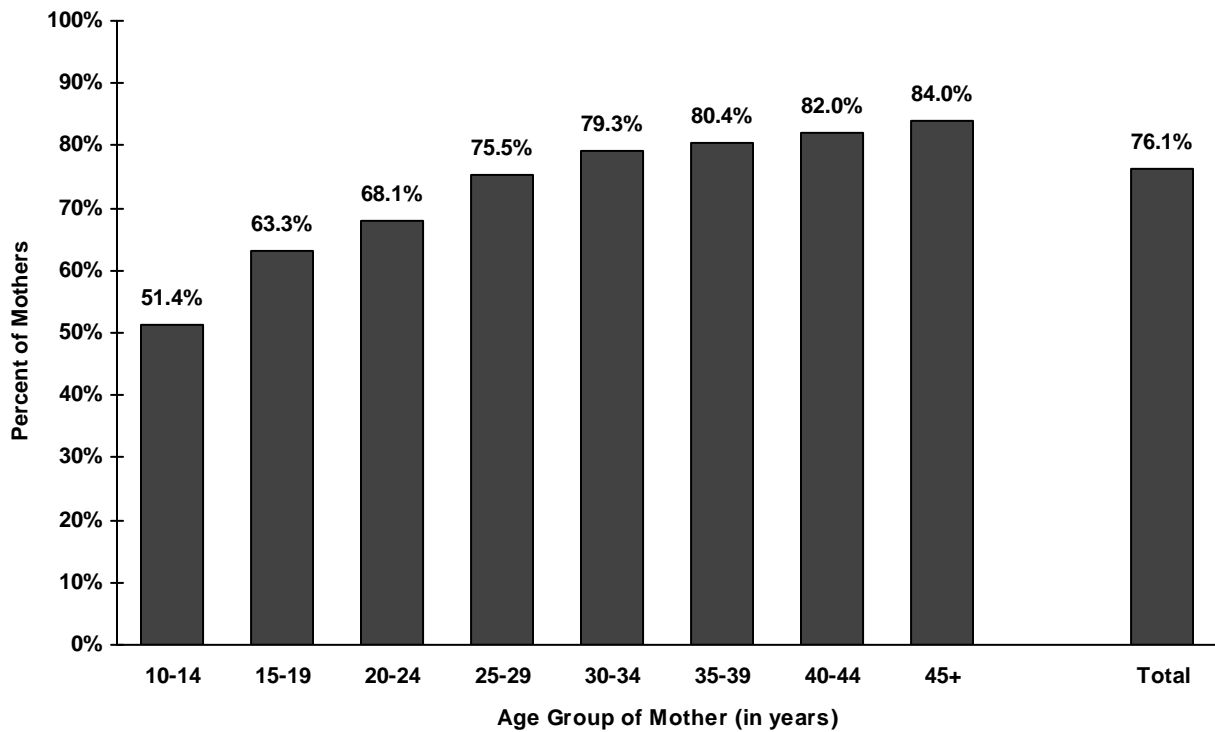
1. Differences in the number of births from previous publications are the result of updating of the birth files. The number of births for all age groups does not always add to the total number of births as mother's age is sometimes not recorded on the birth certificate.

2. 2002 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 3. Denominator is female population ages 45-49. 4. Rate represents the total number of births to women age 15-44 per 1,000 women age 15 to 44. 5. Births per 1,000 residents (females and males). Includes births to mothers of all age groups and mothers for whom age is unknown.

**Figure 1. Trends in the Number of Births by Mother's Age Group,  
Massachusetts: 1980-2002**



**Figure 2. Percent of Mothers Breastfeeding or Intending to Breastfeed<sup>1</sup> by Age Group, Massachusetts<sup>2</sup>: 2002**

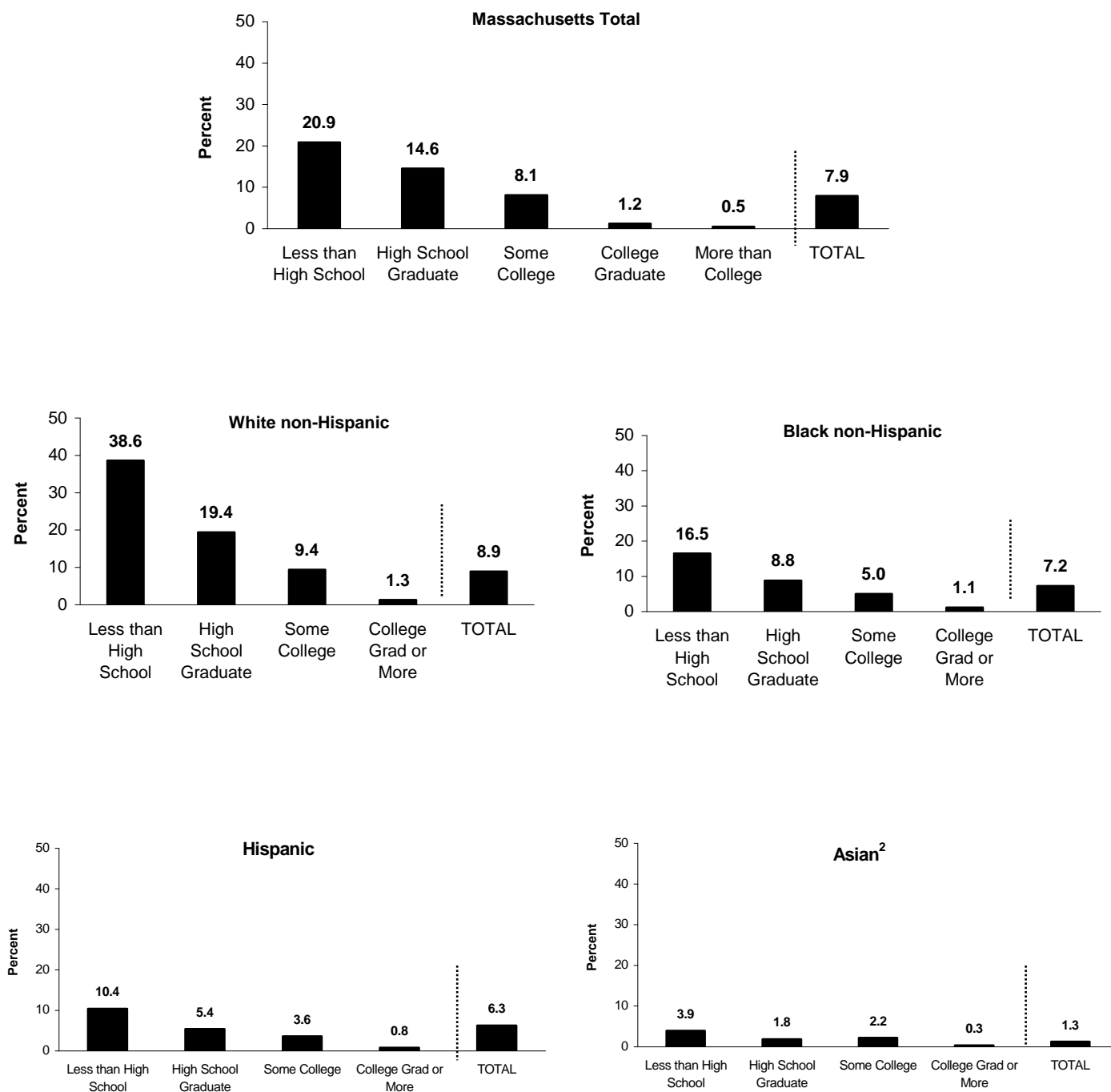


NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Information about breastfeeding was reported by the mother at the time the birth certificate was completed.

2. For race-specific breastfeeding rates see Table 2A.

**Figure 3. Percent of Mothers who Smoked During Pregnancy<sup>1</sup>,  
by Mother's Race/Hispanic Ethnicity and Educational Attainment,  
Massachusetts: 2002**



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on information provided on the birth certificate as reported by the mother. Due to self-reported nature, data on smoking prevalence should be interpreted cautiously. Mothers with more than one delivery are counted for each birth. 2. Caution should be used with Asian data because of small numbers.



**Figure 4. Distribution of Smoking Status<sup>1</sup> during Pregnancy  
by Smoking Status Prior to Pregnancy, Massachusetts: 2002**

**Smoking  
Status<sup>1</sup>  
Prior to  
Pregnancy:**

**Non-Smokers**  
85.3%  
(68,590)

**Light Smokers**  
7.7%  
(6,224)

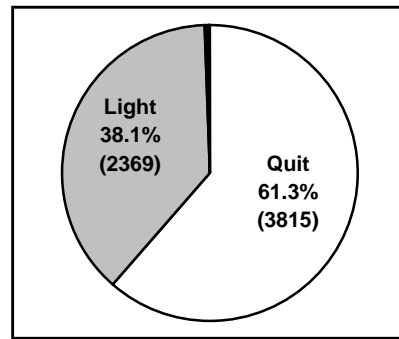
**Moderate Smokers**  
6.0%  
(4,840)

**Heavy Smokers**  
1.0%  
(802)

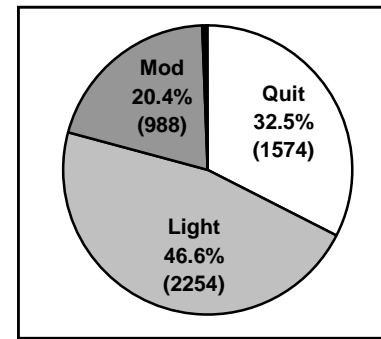
**Smoking  
Status<sup>1</sup>  
During  
Pregnancy:**



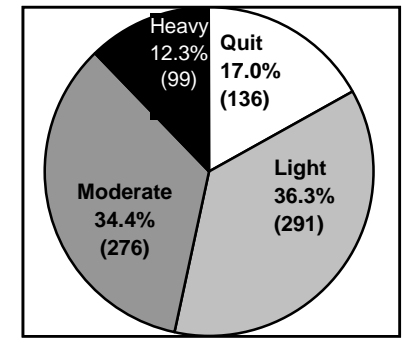
**99.9% of Non-Smokers  
continued not smoking  
(0.1% started smoking)**



**61.3% of Light Smokers quit  
smoking (0.6% increased)**



**79.1% of Moderate Smokers  
decreased the number of  
cigarettes smoked daily or  
quit (0.5% increased)**



**87.7% of Heavy Smokers  
decreased the number of  
cigarettes smoked daily  
or quit**

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Light Smokers=1-10 cigarettes daily; Moderate Smokers=11-20 cigarettes daily; Heavy Smokers=21 cigarettes or more daily.

**Table 5. Parity<sup>1</sup> by Age of Mother, Massachusetts: 2002**

Age of Mother (years)		Total Births	1st	2nd	3rd	4th	5th+
STATE TOTAL	n <sup>2</sup>	80,624	34,911	28,117	11,695	3,777	1,967
	% <sup>3</sup>	100.0	43.4	34.9	14.5	4.7	2.4
10-14	n	73	73	0	0	0	0
	%	100.0	100.0	0.0	0.0	0.0	0.0
15-19	n	4,642	3,872	677	82	4	0
	%	100.0	83.5	14.6	1.8	-- <sup>4</sup>	0.0
20-24	n	11,880	6,580	3,724	1,148	324	80
	%	100.0	55.5	31.4	9.7	2.7	0.7
25-29	n	18,484	8,869	6,037	2,426	751	362
	%	100.0	48.1	32.7	13.2	4.1	2.0
30-34	n	27,163	10,397	10,693	4,145	1,244	632
	%	100.0	38.3	39.4	15.3	4.6	2.3
35-39	n	15,121	4,199	5,826	3,248	1,202	622
	%	100.0	27.8	38.6	21.5	8.0	4.1
40-44	n	3,085	863	1,106	617	237	254
	%	100.0	28.0	35.9	20.1	7.7	8.3
45+	n	175	58	54	29	15	17
	%	100.0	33.5	31.2	16.8	8.7	9.8

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. The number of live births including this birth. 2. State totals include births of unknown parity and unknown mother's age. 3. Percents may not sum to 100.0 due to rounding. 4. Calculations based on fewer than 5 events are excluded.

**Table 6. Trends in Number and Percent Distribution of Births<sup>1</sup> by Plurality and Age, Massachusetts: 1990-2002**

Age Group	Year	Singletons		Multiples <sup>2</sup>						Total births	
		n	%	Twins		Triplets or more		Total Multiples		n	%
		n	%	n	%	n	%	n	%	n	%
<b><u>All Ages</u></b>											
	1990	90,049	97.4	2,312	2.5	99	0.1	2,411	2.6	92,460	100.0
	1991	85,802	97.3	2,285	2.6	89	0.1	2,374	2.7	88,176	100.0
	1992	84,722	97.2	2,347	2.7	133	0.2	2,480	2.8	87,202	100.0
	1993	82,055	97.0	2,367	2.8	205	0.2	2,572	3.0	84,627	100.0
	1994	81,187	96.9	2,357	2.8	214	0.3	2,571	3.1	83,758	100.0
	1995	78,935	96.8	2,429	3.0	198	0.2	2,627	3.2	81,562	100.0
	1996	77,355	96.5	2,621	3.3	194	0.2	2,815	3.5	80,164	100.0
	1997	77,203	96.1	2,856	3.6	262	0.3	3,118	3.9	80,321	100.0
	1998	78,004	95.8	3,114	3.8	288	0.4	3,402	4.2	81,406	100.0
	1999	77,473	95.8	3,147	3.9	246	0.3	3,393	4.2	80,866	100.0
	2000	78,075	95.7	3,263	4.0	244	0.3	3,507	4.3	81,582	100.0
	2001	77,409	95.6	3,371	4.2	234	0.3	3,605	4.4	81,014	100.0
	2002	76,673	95.1	3,708	4.6	243	0.3	3,951	4.9	80,624	100.0
<b><u>Ages &lt;35</u></b>											
	1990	79,081	97.5	1,946	2.4	70	0.1	2,016	2.5	81,097	100.0
	1991	74,810	97.5	1,863	2.4	76	0.1	1,939	2.5	76,749	100.0
	1992	73,043	97.3	1,914	2.6	103	0.1	2,017	2.7	75,060	100.0
	1993	70,042	97.2	1,849	2.6	158	0.2	2,007	2.8	72,049	100.0
	1994	68,644	97.2	1,844	2.6	164	0.2	2,008	2.8	70,652	100.0
	1995	65,669	97.2	1,787	2.6	141	0.2	1,928	2.9	67,597	100.0
	1996	63,560	96.9	1,935	2.9	126	0.2	2,061	3.1	65,621	100.0
	1997	62,598	96.7	1,949	3.0	170	0.3	2,119	3.3	64,717	100.0
	1998	62,719	96.4	2,193	3.4	170	0.3	2,363	3.6	65,082	100.0
	1999	61,816	96.4	2,147	3.3	150	0.2	2,297	3.6	64,113	100.0
	2000	61,659	96.4	2,205	3.4	130	0.2	2,335	3.6	63,994	100.0
	2001	60,704	96.3	2,211	3.5	134	0.2	2,345	3.7	63,049	100.0
	2002	59,736	96.0	2,379	3.8	127	0.2	2,506	4.0	62,242	100.0
<b><u>Ages 35+</u></b>											
	1990	10,968	96.5	366	3.2	29	0.3	395	3.5	11,363	100.0
	1991	10,987	96.2	422	3.7	13	0.1	435	3.8	11,422	100.0
	1992	11,675	96.2	433	3.6	30	0.3	463	3.8	12,138	100.0
	1993	12,007	95.5	518	4.1	47	0.4	565	4.5	12,572	100.0
	1994	12,543	95.7	513	3.9	50	0.4	563	4.3	13,106	100.0
	1995	13,264	95.0	642	4.6	57	0.4	699	5.0	13,963	100.0
	1996	13,793	94.8	686	4.7	68	0.5	754	5.2	14,547	100.0
	1997	14,602	93.6	907	5.8	92	0.6	999	6.4	15,601	100.0
	1998	15,282	93.6	921	5.6	118	0.7	1,039	6.4	16,321	100.0
	1999	15,657	93.5	1,000	6.0	96	0.6	1,096	6.5	16,753	100.0
	2000	16,412	93.3	1,058	6.0	114	0.6	1,172	6.7	17,584	100.0
	2001	16,703	93.0	1,160	6.5	100	0.6	1,260	7.0	17,963	100.0
	2002	16,936	92.1	1,329	7.2	116	0.6	1,445	7.9	18,381	100.0

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Differences in the number of births from previous publications are the result of updating of files. 2. Numbers of multiples (n) represent individual infants rather than sets of infants.

**Table 7. Selected Birth Characteristics by Maternal Education, Massachusetts: 2002**

	<u>Less than High School</u>		<u>High School Graduate</u>		<u>Some College</u>		<u>College Graduate</u>		<u>More than College</u>	
	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>
<b>State Total</b>	7,887	9.8	20,251	25.2	18,241	22.7	21,411	26.6	12,650	15.7
<b>Race</b>										
<b>White non-Hispanic</b>	2,859	4.9	12,849	22.1	13,629	23.5	18,251	31.4	10,491	18.1
<b>Black non-Hispanic</b>	829	14.0	2,170	36.6	1,812	30.5	788	13.3	336	5.7
<b>Hispanic</b>	3,208	33.6	3,654	38.3	1,726	18.1	645	6.8	303	3.2
<b>Asian</b>	664	12.5	1,041	19.7	726	13.7	1,501	28.3	1,364	25.8
<b>Age</b>										
<b>20-29</b>	3,647	12.0	10,675	35.2	8,379	27.6	5,492	18.1	2,111	7.0
<b>30-39</b>	1,472	3.5	7,256	17.2	8,921	21.1	14,894	35.3	9,637	22.8
<b>40+</b>	122	3.8	559	17.2	660	20.3	1,009	31.1	894	27.6
<b>Non-U.S.-born<sup>2</sup></b>	2,883	36.6	5,837	28.9	3,536	19.4	3,786	17.7	2,743	21.7
<b>Unmarried</b>	5,752	72.9	9,293	45.9	4,851	26.6	1,206	5.6	452	3.6
<b>Publicly-financed prenatal care</b>	6,197	79.8	10,122	50.9	4,603	25.6	1,185	5.7	348	2.8
<b>Very low birthweight<sup>3</sup></b>	141	1.8	325	1.6	227	1.2	237	1.1	170	1.3
<b>Low birthweight<sup>4</sup></b>	738	9.4	1,766	8.7	1,301	7.1	1,329	6.2	901	7.1
<b>Adequate prenatal care<sup>5</sup></b>	5,603	71.8	16,193	80.6	15,513	85.6	18,988	89.2	11,387	90.5
<b>Cesarean section delivery</b>	1,686	21.5	5,468	27.1	5,383	29.6	6,307	29.5	3,671	29.1
<b>Breastfeeding<sup>6</sup></b>	4,779	61.2	13,081	65.5	13,223	73.6	17,801	85.2	11,308	91.2
<b>Multiple births</b>	185	2.3	769	3.8	844	4.6	1,256	5.9	891	7.0
<b>Smoking during pregnancy</b>	1,644	20.9	2,947	14.6	1,473	8.1	262	1.2	63	0.5

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. For state total, race and age categories, percentages are based on row totals. For all other categories, percentages are based on column totals. 2. Includes women born outside of the 50 U.S. States, Washington D.C., and Puerto Rico/U.S. territories ( the U.S. Virgin Islands, and Guam). 3. Very low birthweight: less than 1,500 grams or 3.3 pounds. 4. Low birthweight: less than 2,500 grams or 5.5 pounds. 5. Beginning with last year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 6. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed.

**Table 8. Comparison of Massachusetts Perinatal Health Indicators to Healthy People 2010 Objectives<sup>1</sup>**

Healthy People 2010 Objectives (Focus Area 16: Maternal, Infant and Child Health <sup>2</sup> )	HP2010 Target	Massachusetts				Has Massachusetts achieved HP2010 target? ✓ = YES ○ = NO, but within 25% of target ● = NO, > 25% from target
		1999	2000	2001	2002	
<b>Fetal, Infant, and Maternal Deaths</b>						
16-1a. Fetal Mortality Rate <sup>3</sup>	4.1	5.2	5.3	4.7	4.6	○
16-1b. Perinatal Mortality Rate <sup>4</sup>	4.5	6.0	5.4	5.6	4.7	○
16-1c. Infant Mortality Rate <sup>5</sup>	4.5	5.2	4.6	5.0	4.9	○
16-1d. Neonatal Mortality Rate <sup>6</sup>	2.9	4.1	3.5	3.8	3.7	●
16-1e. Postneonatal Mortality Rate <sup>7</sup>	1.2	1.1	1.1	1.2	1.2	✓
16-4. Maternal Mortality Ratio <sup>8</sup>	3.3	0.0	1.2	4.9	2.4	✓
<b>Risk Factors</b>						
16-10a. Low Birthweight <sup>9</sup> (%)	5.0	7.1	7.1	7.2	7.5	●
16-10b. Very Low Birthweight <sup>10</sup> (%)	0.9	1.4	1.4	1.4	1.4	●
16-11a. Preterm <sup>11</sup> (%)	7.6	7.6	8.3	8.0	8.5	○
<b>Prenatal Care</b>						
16-6a. Care beginning in first trimester (%)	90	84.3	83.8	84.3	84.2	○
16-6b. Early and adequate care <sup>12</sup> (%)	90	82.9	83.3	85.2	85.0	○
<b>Obstetrical Care</b>						
16-8. Very Low Birthweight <sup>10</sup> Infants born at Level III Hospitals <sup>13</sup> (%)	90	82.5	83.4	79.1	81.2	○
16-9a. Cesarean Sections: Low-Risk <sup>14</sup> Women Giving Birth for the First Time (%)	15	18.8	20.5	22.0	24.0	●
16-9b. Cesarean Sections: Low-Risk <sup>14</sup> Women with Prior Cesarean Section (%)	63	68.8	72.7	79.2	84.2	●
<b>Breastfeeding</b>						
16-19a. Breastfeeding <sup>15</sup> (%)	75	72.4	73.8	75.3	76.1	✓
<b>Prenatal Substance Exposure</b>						
16-17c. Abstinence from Smoking (%)	99	89.3	90.3	90.9	92.1	○

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. National health promotion and disease prevention agenda established by the U.S. Dept. of Health and Human Services. 2. Goal: to improve the health and well-being of women, infants, children, and families. 3. Number of fetal deaths per 1,000 fetal deaths plus live births. 4. Number of fetal and infant deaths in perinatal period (from 28 weeks gestation (inclusive) to 6 days (inclusive) after birth per 1,000 fetal deaths plus live births. 5. Number of infant deaths (under one year of age) per 1,000 live births. 6. Number of deaths to infants less than 28 days of age per 1,000 live births. 7. Number of deaths to infants 28-364 days of age per 1,000 live births. 8. See Definition of Rates section in Appendix. 9. Less than 2,500 grams, or 5.5 pounds. 10. Less than 1,500 grams, or 3.3 pounds. 11. Born before completion of 37<sup>th</sup> week of gestation. 12. Based on Adequacy of Prenatal Care Utilization Index (see glossary). 13. Facilities for high-risk deliveries and neonates that can provide care to very small infants, including mechanical ventilation and neonatal surgery and special care for transferred patients and for which a full-time neonatologist serves as the director. 14. "Low-risk"= full term birth, singleton, vertex presentation. 15. HP2010 specifies objective as mother breastfeeding in "early postpartum period." Massachusetts data is based on mother's self-report of current breastfeeding or intention to breastfeed at the time the birth certificate is completed.



## **CHAPTER 2**

# **TEEN BIRTH CHARACTERISTICS**





## **Birth Numbers and Rates**

In 2002, 4,642 births occurred to Massachusetts resident women ages 15-19, compared with 4,979 births for this age group in 2001 (Table 9). The number of resident live teen births in Massachusetts has decreased by 29% since 1992 (6,555 births) (Table 11). About one-third of the teen births were to women ages 15-17 (1,498 births), and two-thirds were to women ages 18-19 (3,144 births) (Table 9).

In 2002, in addition to the births to 15-19 year olds, there were 73 births to younger mothers ages 12 to 14, which represents a 6% decline in births in this age group from 2001 (Table 4).

In 2002, the teen birth rate was 22.6 births per 1,000 women ages 15-19 years, a decrease of 7% from 2001 (24.3) (Table 1). The Massachusetts teen birth rate has decreased steadily from 35.4 births per 1,000 women ages 15-19 in 1990 to 22.6 in 2002, the lowest rate in the last 3 decades (Figure 6).

The Massachusetts teen birth rate in 2002 was 47% below the U.S. teen birth rate of 42.9 births per 1,000 women ages 15-19 (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2) (Figure 6).

Overall, teen mothers were more likely to have specific characteristics that may be associated with adverse birth outcomes. Teen mothers were less likely to breastfeed, less likely to be married, less likely to receive adequate prenatal care, and more likely to smoke during pregnancy than adult women. Teen mothers also had more adverse birth outcomes (i.e. higher rates of low birthweight and preterm infants) than adult women, reflecting an increased risk associated with adolescent maternity.

## **Distribution of Births by Race and Hispanic Ethnicity and Mother's Birthplace**

In 2002, 46.4% of births to Massachusetts residents ages 15-19 (2,151) were to white non-Hispanic mothers; 32.6% (1,513) were to Hispanic mothers; 13.4% (622) were to black non-Hispanic mothers; 4.4% (203) were to Asian mothers; and 3.2% (149) were to mothers of other races (Table 9).

In 2002, birth rates among resident teen women were in the same relative order by race and Hispanic ethnicity as they were in 1990 (black non-Hispanic and Hispanic women had the highest teen birth rates while white non-Hispanic women had the lowest), and they have decreased for all groups. However, black non-Hispanics have had the greatest decrease, 49% from 1990 (89.2) to 2002 (45.9); the white non-Hispanic teen birth rate has decreased by 44% (from 24.0 to 13.4); and the Asian teen birth rate has decreased by 43% (from 32.7 to 18.6). The Hispanic teen birth rate has declined the least at 37% (from 120.7 to 76.4) (Figure 7).

Seventy-seven percent of teen births were to mothers who were born in the 50 U.S. states or D.C. Eight percent of teen births were to mothers born in Puerto Rico or other U.S. Territories, and the percentage of births to non-U.S.-born teen mothers was 15% (Table 9).

## **Low Birthweight**

In 2002, 10.3% of the infants born to women under age 20 were low birthweight (less than 2,500 grams or 5.5 pounds) as compared with 7.4% of infants born to Massachusetts women ages 20 and older (Figure 5).

The percentage of low birthweight infants was 17% greater for teen mothers ages 15-17 (11.7%) than for teens ages 18-19 (10.0%) (Table 9).

## **Preterm**

In 2002, 10.2% of infants born to women under age 20 were preterm (born before the mother had completed the 37th week of pregnancy) as compared with 8.3% of infants born to Massachusetts women ages 20 and older (Figure 5). The percentage of preterm infants born to teen mothers increased by 13% from 2001 (8%) to 2002 (9%) (data not shown).

The percentage of preterm infants was 32% greater for teen mothers ages 15-17 (10.7%) than for teens ages 18-19 (8.1%) (Table 9).

## **Prenatal Care**

In 2002, of the births to women under age 20, 71.5% of the mothers received adequate prenatal care, compared with 85.5% of births to women ages 20 and over (Figure 5). (Adequacy of prenatal care is a measure of the timing and number of prenatal care visits.)

The percentage of women ages 15-17 who received inadequate prenatal care (22.1%) was 18% greater than that of women ages 18-19 (18.8%) (Table 9).

Over 75% of women less than 20 years of age had their prenatal care funded by public sources, compared with 25% of women ages 20 and over (Figure 5).

## **Teen Birth Characteristics in the 30 Largest Massachusetts Cities and Towns**

In 2002, among live births to women ages 15-19 who were residents of the 30 largest cities and towns in the Commonwealth:

- Teen birth rates (number of births per 1,000 females 15-19) were highest in Lawrence (80), Springfield (71), New Bedford (58), Lowell (58), and Fall River and Lynn (both at 54). These communities had rates two to three times the statewide rate of 22.6. All of these communities experienced decreases in teen birth rates from the previous year.
- Teen birth rates were lowest in Newton (3 teen births per 1,000 females 15-19), Brookline (4), and Medford (6) (Table 10).

- Among births to teen mothers, six communities (Barnstable, Lynn, Pittsfield, Haverhill, Brockton and Lawrence) recorded low birthweight percentages that were at least 25% higher than the statewide average of 10% for teen mothers (Table 10).
- Over 85% of mothers ages 15-19 living in Lowell, Springfield, Lynn, and Fall River had their prenatal care paid for by a public source. Only 20% of mothers ages 15-19 living in Arlington had their prenatal care paid for by a public source.
- Over 80% of mothers ages 15-19 living in Brookline, Newton, Lawrence, Haverhill, Cambridge, and Framingham received adequate prenatal care. In contrast, fewer than 60% of teen mothers living in Lowell, Attleboro, and Pittsfield, received adequate prenatal care (Table 10).

### **Communities with Highest Teen Births**

Among the communities with the greatest number of teen births, teen birth rates were highest in Holyoke (82), Chelsea (82), Lawrence (80), and Springfield (70). These communities had rates over three times the statewide rate of 22.6 teen births per 1,000 females 15-19 (Table 11).

### **Tobacco Use**

In 2002, 15.9% of teen births were to mothers who reported smoking cigarettes during their pregnancies (Table 9). In comparison, 7.4% of mothers ages 20 and over reported smoking during pregnancy (Figure 5).

For teen mothers ages 18-19, 17.1% smoked cigarettes during their pregnancies compared with 13.7% of mothers ages 15-17 (Table 9).

### **Parity**

In 2002, 83.5% of all live births to teen mothers were the mother's first live-born infant. The percentage of births that were the teen mother's second live-born infant was 14.6%, and only 1.9% were the mother's third or greater live-born infants (Table 9).

As expected, mothers ages 18-19 had the greatest percentage of previous live births; almost three times higher (20.4% v. 8.1%) than teens ages 15-17 (Table 9).

### **Plurality**

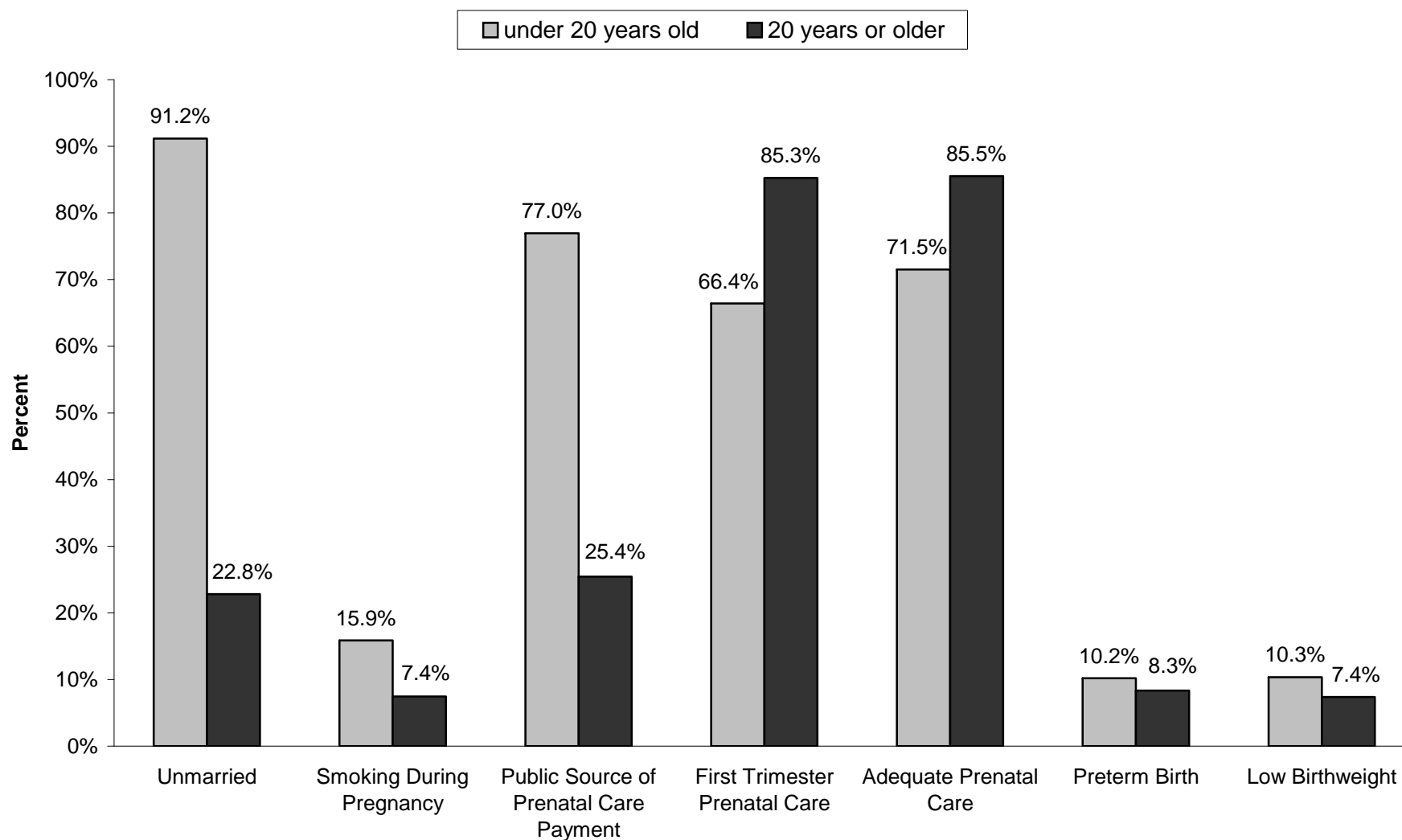
Plurality represents the number of births to a woman in one delivery. In 2002, 98.0% of all births to mothers ages 15-19 were singletons, and 2.0% were twins or higher order multiple births. Of these multiple births, 89 were twins and 3 triplets (Table 9).

**Table 9. Summary of Selected Teen Birth Characteristics, Massachusetts: 2002**

	Age 15-17		Age 18-19		Age 15-19	
	N	% <sup>1</sup>	N	% <sup>1</sup>	N	% <sup>1</sup>
<b>State total</b>	1,498	32.3%	3,144	67.7%	4,642	100.0%
<b>Maternal Demographics</b>						
<b>Race/Hispanic Ethnicity</b>						
White non-Hispanic	582	38.9%	1,569	50.0%	2,151	46.4%
Black non-Hispanic	221	14.8%	401	12.8%	622	13.4%
Asian	77	5.1%	126	4.0%	203	4.4%
Hispanic	563	37.6%	950	30.2%	1,513	32.6%
Other	54	3.6%	95	3.0%	149	3.2%
<b>Birthplace</b>						
U.S. States / D.C.	1,169	78.1%	2,395	76.2%	3,564	76.8%
Puerto Rico / US Terr.	143	9.6%	225	7.2%	368	7.9%
Non-U.S.-born	185	12.4%	521	16.6%	706	15.2%
<b>Prenatal care funding<sup>2</sup></b>						
Public	1,112	75.7%	2,393	77.4%	3,505	76.8%
Private, other	357	24.3%	699	22.6%	1,056	23.2%
<b>Pregnancy related factors</b>						
<b>Adequacy of Prenatal Care<sup>3</sup></b>						
Adequate Total <sup>4</sup>	1,042	70.5%	2,260	72.5%	3,302	71.8%
Adequate Intensive	544	36.8%	1,092	35.0%	1,636	35.6%
Adequate Basic	498	33.7%	1,168	37.5%	1,666	36.2%
Intermediate	110	7.4%	270	8.7%	380	8.3%
Inadequate/None	327	22.1%	587	18.8%	914	19.9%
Unknown	19	1.3%	27	0.9%	46	1.0%
<b>Parity<sup>6</sup></b>						
1	1,372	91.8%	2,500	79.6%	3,872	83.5%
2	111	7.4%	566	18.0%	677	14.6%
3+	11	0.7%	75	2.4%	86	1.9%
<b>Smoking during Pregnancy</b>						
Yes	205	13.7%	537	17.1%	742	16.0%
No	1,292	86.3%	2,605	82.9%	3,897	84.0%
<b>Birth outcomes</b>						
<b>Birthweight</b>						
< 500 g	4	-- <sup>5</sup>	10	0.3%	14	0.3%
500-1,499 g	29	1.9%	47	1.5%	76	1.6%
1,500-2,499 g	142	9.5%	246	7.8%	388	8.4%
LBW (0-2,499 g)	175	11.7%	303	10%	478	10.3%
2,500-3,999 g	1,260	84.3%	2,613	83.2%	3,873	83.6%
4000+ g	60	4.0%	224	7.1%	284	6.1%
<b>Gestational age</b>						
< 28 weeks	21	1.4%	36	1.2%	57	1.2%
< 37 weeks	159	10.7%	254	8.1%	413	8.9%
37-42 weeks	1,307	87.8%	2,835	90.7%	4,142	89.8%
43+ weeks	1	-- <sup>5</sup>	2	-- <sup>5</sup>	3	-- <sup>5</sup>
<b>Plurality</b>						
Singleton	1,469	98.1%	3,081	98.0%	4,550	98.0%
Multiple birth	29	1.9%	63	2.0%	92	2.0%

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.  
1. For state total row, percentages are based on total births to women ages 15-19. For the rest of the table, percentages are based on all births for a given age group and characteristic. 2. See Glossary for definitions of categories. 3. Based on Adequacy of Prenatal Care Utilization (APNCU) Index. 4. Adequate Total = Adequate Basic + Adeq. Intensive. 5. Calculations based on fewer than five events are excluded. 6. Number of live births including the current birth.

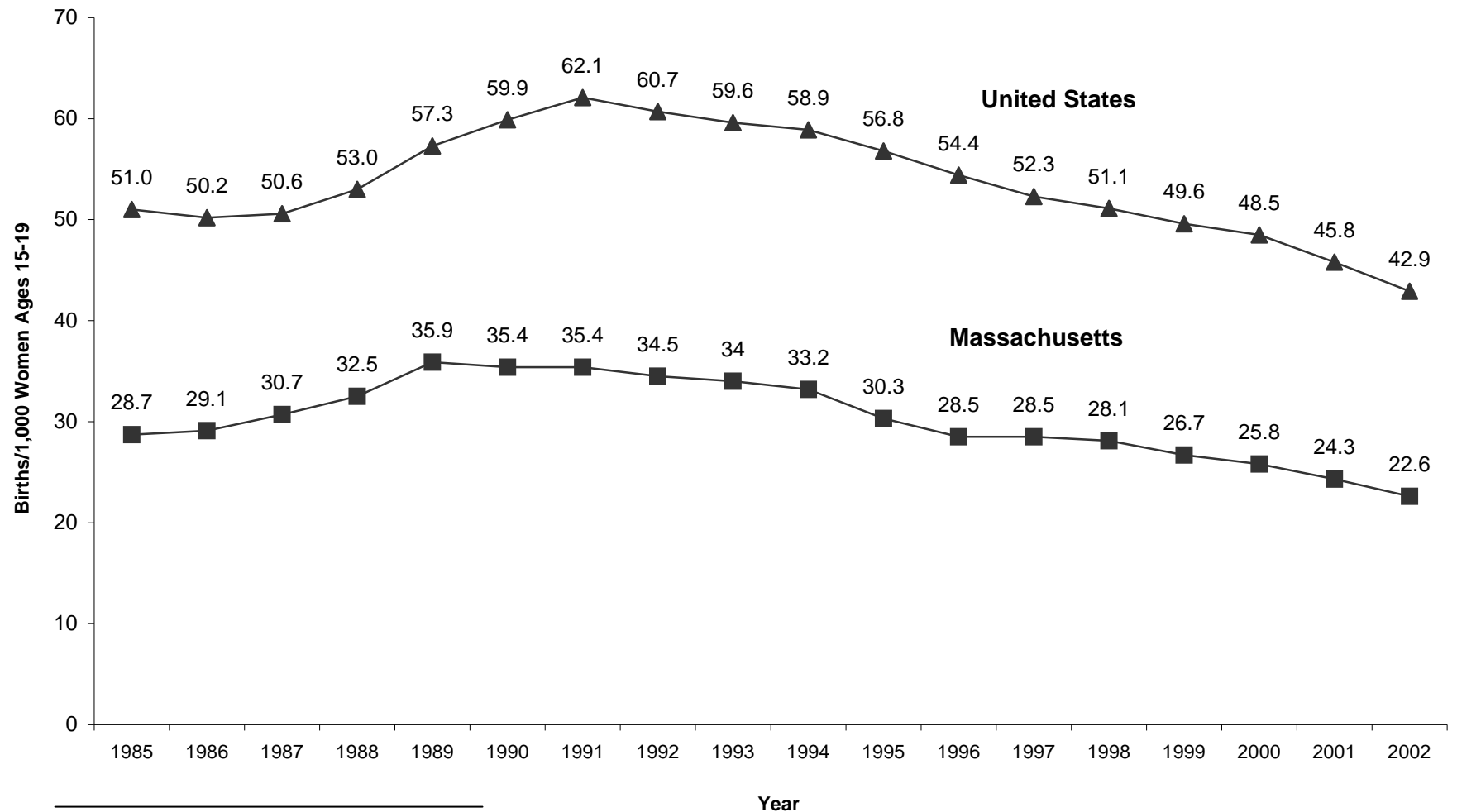
**Figure 5. Comparison of Teen vs. Adult Births, Selected Characteristics, Massachusetts: 2002**



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

Definitions: Unmarried = marital status at time of birth. Adequate Prenatal Care = based on Adequacy of Prenatal Care Utilization (APNCU) Index. See Appendix (Glossary and Technical Notes) for more details on the APNCU Index. Preterm Birth = gestational age less than 37 weeks, based on clinical estimate of gestational age. Low Birthweight = less than 2,500 grams (5.5 lbs.).

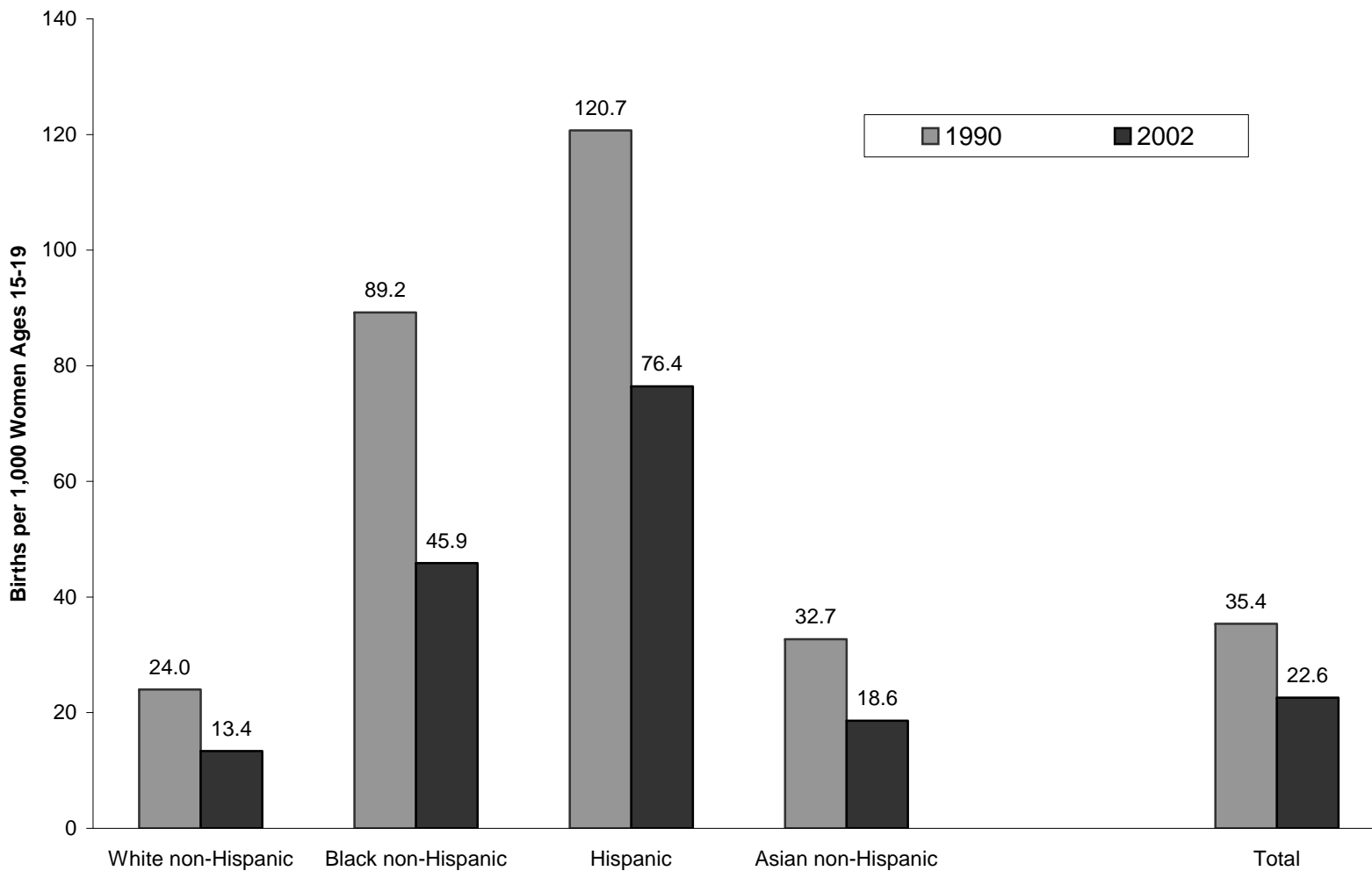
**Figure 6. Trend in Birth Rates Among Women Ages 15-19,  
Massachusetts and the United States: 1985-2002**



Teen birth rate is number of births to women ages 15-19 per 1,000 women ages 15-19

Data sources: 1) U.S. annual natality data (NCHS) and 1990 U.S. Census data (population data used in denominators); 2) Massachusetts: annual birth data files, decennial Census counts (1990, 2000) and intercensal population estimates based on MISER (Massachusetts Institute for Social and Economic Research) population estimates for 1991 through 1998 and DPH population estimates for 1999. 2000-2002 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts.

**Figure 7. Birth Rates Among Women Ages 15-19 by Mother's Race/Hispanic Ethnicity, Massachusetts: 1990 and 2002**



Teen birth rate is number of births to women ages 15-19 per 1,000 women ages 15-19

Population data sources: denominators for 1990 rates are based on the 1990 U.S. Census. 2002 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts.

**Table 10. Resident Teen Birth Characteristics, 30 Largest Municipalities<sup>1</sup>, Massachusetts: 2002**

Municipality	Total Population Rank	Female Population, age 15-19	Number of Teen Births	Teen Birth Rate <sup>2</sup>	Mother's Race and Hispanic Ethnicity (% of teen births)			
					White non-Hispanic	Black non-Hispanic	Hispanic	Asian or other <sup>3</sup>
<b>State Total</b>		<b>205,277</b>	<b>4,642</b>	<b>22.6</b>	<b>46.4</b>	<b>13.4</b>	<b>32.6</b>	<b>7.6</b>
Arlington	29	767	5	6.5	80.0	20.0	0.0	0.0
Attleboro	30	1,151	32	27.8	78.1	0.0	6.3	15.6
Barnstable	25	1,287	35	27.2	71.4	8.6	8.6	11.4
Boston	1	22,240	664	29.9	12.1	44.5	34.2	9.2
Brockton	6	3,304	163	49.3	30.1	31.9	21.5	16.6
Brookline	17	1,382	5	3.6	40.0	20.0	40.0	0.0
Cambridge	5	3,733	24	6.4	16.7	50.0	29.2	4.2
Chicopee	21	1,809	60	33.2	53.3	3.3	41.7	1.7
Fall River	8	2,915	158	54.2	74.1	8.9	13.3	3.8
Framingham	14	1,925	41	21.3	46.3	9.8	36.6	7.3
Haverhill	16	1,793	67	37.4	70.1	7.5	20.9	1.5
Lawrence	13	2,847	227	79.7	11.9	1.3	84.6	2.2
Lowell	4	3,913	228	58.3	36.8	1.8	26.8	34.6
Lynn	9	2,990	162	54.2	24.7	8.0	56.8	10.5
Malden	18	1,391	25	18.0	64.0	8.0	4.0	24.0
Medford	20	1,749	10	5.7	80.0	10.0	10.0	0.0
Methuen	28	1,264	26	20.6	65.4	0.0	34.6	0.0
New Bedford	7	2,978	175	58.8	52.3	5.7	32.2	9.8
Newton	11	3,411	9	2.6	66.7	11.1	11.1	11.1
Peabody	24	1,300	10	7.7	80.0	0.0	10.0	10.0
Pittsfield	27	1,361	61	44.8	73.8	8.2	13.1	4.9
Plymouth	23	1,577	22	14.0	72.7	13.6	9.1	4.5
Quincy	10	1,950	31	15.9	54.8	9.7	9.7	25.8
Revere	26	1,215	51	42.0	54.9	7.8	19.6	17.6
Somerville	12	2,087	50	24.0	46.0	18.0	36.0	0.0
Springfield	3	6,037	423	70.1	16.5	22.2	59.8	1.4
Taunton	19	1,652	57	34.5	66.1	1.8	19.6	12.5
Waltham	15	2,251	24	10.7	45.8	8.3	37.5	8.3
Weymouth	22	1,331	21	15.8	76.2	4.8	9.5	9.5
Worcester	2	6,918	226	32.7	42.0	10.6	43.4	4.0



**Table 10 (cont.). Resident Teen Birth Characteristics, 30 Largest Municipalities,  
Massachusetts: 2002**

Municipality	Public payment for prenatal care <sup>4</sup> (%)	Unmarried (%)	Low Birthweight <sup>6</sup> (%)	Preterm <sup>7</sup> (%)	Adequacy of Prenatal Care <sup>8</sup>			
					Adequate Intensive	Adequate Basic	Intermediate	Inadequate
<b>State Total</b>	<b>76.9</b>	<b>91.1</b>	<b>10.3</b>	<b>10.2</b>	<b>35.6</b>	<b>36.3</b>	<b>8.3</b>	<b>19.9</b>
Arlington	20.0	80.0	0.0	0.0	60.0	20.0	0.0	20.0
Attleboro	67.9	93.8	3.1	9.4	32.3	16.1	25.8	25.8
Barnstable	82.4	100.0	17.1	8.6	42.9	28.6	5.7	22.9
Boston	82.1	94.3	12.4	13.6	29.6	44.0	8.3	18.1
Brockton	85.0	93.9	12.9	11.7	34.0	32.7	6.2	27.2
Brookline	60.0	80.0	0.0	0.0	0.0	100.0	0.0	0.0
Cambridge	50.0	83.3	0.0	0.0	41.7	41.7	4.2	12.5
Chicopee	80.0	93.3	8.3	10.0	30.0	43.3	11.7	15.0
Fall River	91.5	89.2	10.8	7.6	67.1	10.1	3.2	19.6
Framingham	75.6	75.6	7.3	9.8	34.2	46.3	4.9	14.6
Haverhill	63.6	94.0	13.4	14.9	40.3	44.8	3.0	11.9
Lawrence	81.0	90.8	12.8	8.8	44.9	41.4	1.3	12.3
Lowell	86.0	92.5	10.5	10.1	26.0	32.2	16.3	25.6
Lynn	89.3	86.4	14.8	16.1	39.5	30.3	9.3	21.0
Malden	48.0	76.0	4.0	4.0	48.0	24.0	4.0	24.0
Medford	80.0	90.0	0.0	0.0	10.0	70.0	20.0	0.0
Methuen	53.9	92.3	11.5	15.4	38.5	34.6	3.9	23.1
New Bedford	83.9	94.3	11.0	6.6	30.6	41.0	8.1	20.2
Newton	77.8	66.7	11.1	11.1	55.6	33.3	0.0	11.1
Peabody	60.0	80.0	10.0	10.0	70.0	10.0	10.0	10.0
Pittsfield	75.4	93.4	14.8	18.3	15.0	28.3	38.3	18.3
Plymouth	54.6	100.0	9.1	9.1	50.0	18.2	18.2	13.6
Quincy	67.7	93.6	9.7	6.5	23.3	53.3	3.3	20.0
Revere	72.6	90.2	7.8	7.8	56.9	17.7	3.9	21.6
Somerville	68.0	92.0	12.0	8.0	32.0	36.0	10.0	22.0
Springfield	87.1	92.9	11.4	12.7	31.9	31.4	9.1	27.6
Taunton	81.8	94.7	3.6	7.1	40.0	29.1	10.9	20.0
Waltham	60.9	83.3	8.3	8.7	29.2	41.7	16.7	12.5
Weymouth	66.7	85.7	4.8	4.8	28.6	33.3	14.3	23.8
Worcester	70.7	86.3	9.3	10.7	31.8	40.4	10.8	17.0

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. The 30 largest municipalities are the cities and towns in Massachusetts with the largest populations according to DPH 2000 population estimates, based on the U.S. Census 2000 population counts (see Technical Notes in Appendix). 2 Birth rates represent the number of births per 1,000 females age 15-19. 3 Mothers who designated themselves as Asian, American Indian, or Other. 4. See Glossary under "Prenatal Care Payment Source." 5. Calculations based on fewer than five teen births overall are excluded. 6. Less than 2,500 grams or 5.5 pounds. 7. Less than 37 weeks gestational age. 8. Based on Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary and Technical Notes in the Appendix for definitions of index and adequacy categories.

**Table 11. Trends in Teen Birth Rates for Selected Communities<sup>1</sup>, Ranked by 2002 Teen Birth Rate<sup>2</sup>,  
Massachusetts: 2002, 2001, 1992**

		2002		2001		1992 <sup>3</sup>	
2002 Rank	Municipality	Number of Teen Births	Teen Birth Rate	Number of Teen Births	Teen Birth Rate	Number of Teen Births	Teen Birth Rate
	<b>State Total</b>	<b>4,642</b>	<b>22.6</b>	<b>4,979</b>	<b>24.3</b>	<b>6,555</b>	<b>31.7</b>
<b>1</b>	Holyoke	124	82.0	133	87.9	185	127.9
<b>2</b>	Chelsea	90	81.7	89	80.8	87	95.1
<b>3</b>	Lawrence	227	79.7	271	95.2	302	109.7
<b>4</b>	Springfield	423	70.1	431	71.4	523	87.9
<b>5</b>	New Bedford	175	58.8	185	62.1	261	75.7
<b>6</b>	Lowell	228	58.3	215	54.9	275	72.3
<b>7</b>	Fall River	158	54.2	155	53.2	209	65.4
<b>8</b>	Lynn	162	54.2	158	52.8	171	70.0
<b>9</b>	Wareham	33	51.6	20	31.3	28	48.1
<b>10</b>	Brockton	163	49.3	170	51.5	221	69.4
<b>11</b>	Pittsfield	61	44.8	49	36.0	55	35.9
<b>12</b>	Fitchburg	67	44.1	91	59.9	107	60.2
<b>13</b>	Revere	51	42.0	50	41.2	58	54.5
<b>14</b>	Haverhill	67	37.4	62	34.6	98	62.9
<b>15</b>	Taunton	57	34.5	63	38.1	79	50.7
<b>16</b>	Chicopee	60	33.2	73	40.4	76	40.6
<b>17</b>	Worcester	226	32.7	269	38.9	384	56.6
<b>18</b>	Leominster	39	32.0	37	30.3	51	45.9
<b>19</b>	Boston	664	29.9	702	31.6	1,050	48.7
<b>20</b>	Everett	30	28.8	28	26.9	28	27.6
<b>21</b>	Attleboro	32	27.8	39	33.9	41	35.5
<b>22</b>	Barnstable	35	27.2	36	28.0	27	25.1
<b>23</b>	Somerville	50	24.0	42	20.1	65	29.7
<b>24</b>	Framingham	41	21.3	46	23.9	47	21.0
<b>25</b>	Quincy	31	15.9	30	15.4	55	23.7

1. Selected communities include the 25 Massachusetts cities and towns with the greatest number of teen births. Ranking is by 2001 teen birth rate. 2. Rates are per 1,000 females ages 15-19 per city/town.  
3. Source for 1991 births and rates: Massachusetts Community Health Information Profile (MassCHIP), MDPH, v2.8 r270, January 2003; natality dataset and MISER 1991 population estimate.

## **CHAPTER 3**

### **INFANT AND MATERNAL MORTALITY**



## Overall Changes in Infant Mortality Rate

In 2002, there were 397 infant deaths (deaths of children less than one year of age) among Massachusetts residents, 10 fewer infant deaths than in 2001, and **the second lowest number of infant deaths in Massachusetts history** (Table 12A).

The infant mortality rate (IMR) in 2002 was 4.9 deaths per 1,000 live births, which was slightly lower than the 2001 rate of 5.0, and a 30% decrease since 1990. **The 2002 IMR is the second lowest rate ever recorded for the state** (Table 12A).

According to final U.S. statistics for 2001, the **infant mortality rate (IMR)** in Massachusetts (4.9) was **28% lower** than the U.S. IMR (6.8) (National Vital Statistics Report, Vol. 52, No. 2, September 15, 2003, p. 3).

## Race and Ethnicity Patterns in Infant Mortality Rates

The 2002 IMR for whites was 4.5 deaths per 1,000 live births in 2002, which was the same as the rate in 2001 (Table 12A). The IMR for black infants was 11.1 deaths per 1,000 live births, which was a 5% decrease from the 2001 rate.

Since 1980, there has been a substantial decline in IMRs among black and white infants. From 1980 to 2002, the IMR decreased by 54% for whites and 40% for blacks. **However, the IMR for black infants, 11.6 deaths per 1,000 live births, was consistently more than twice as high as the IMR for white infants during this time period.** Yet, the disparity in IMR between white and black infants continues to decrease since 2001 (Figure 8).

The Massachusetts death certificate was revised in 1989 to include a Hispanic identifier. This revision enables the calculation of white non-Hispanic, black non-Hispanic, and Hispanic infant mortality rates (Table 12B). Infants born to black non-Hispanic mothers continued to have the highest IMR (11.6 per 1,000 live births), although this rate represented a 4% decrease from the 2001 rate (12.1). Rates decreased also for Hispanic mothers by 4% and for Asian mothers by 3%. Rates remained the same for white non-Hispanic mothers.

The 2002 IMR for Hispanic infants was 70% higher than the white non-Hispanic rate (4.1) and 40% below the black non-Hispanic rate (11.6). Asian infants had the lowest infant mortality rate of all groups in 2002 with an IMR of 3 deaths per 1,000 live births (Table 12B). However, caution should be used when interpreting this rate since it is based on a small number of deaths.

## Neonatal and Post Neonatal Mortality Rates

The overall neonatal mortality rate (deaths among infants less than 28 days old) was 3.7 per 1,000 live births in 2002, which is a decrease of 3% over the 2001 neonatal mortality rate of 3.8 (Table 12B).

As was true for infant mortality, the direction of change differed by race/ethnicity groups. Decreases occurred for black non-Hispanics, while the rate for Asians increased. The rate for white non-Hispanics and Hispanics remained the same as in 2001 (Table 12B).

The overall post neonatal mortality rate (deaths among infants between 28 and 364 days old), was 1.2 in 2002, which was the same as in 2001 (Table 12B). The post neonatal mortality rate for black non-Hispanic infants increased 31% from 2.6 in 2001 to 3.4 in 2002, and remained almost three times that of white non-Hispanics. The post neonatal mortality rate for Hispanic infants decreased 14% in 2002, from 2.1 deaths per 1,000 live births to 1.8 in 2002.

### **Trends in the Time of Infant Deaths**

From 1990 to 2002, the percentage of all infant deaths that occurred in the post neonatal period (28-364 days) declined from 31% to 24%. During the same time period, the percentage of infant deaths that occurred in the very early neonatal period (within the first day after birth) rose from 44% to 52% of all infant deaths, and the percentage of infant deaths occurring later in the neonatal period (from 1-27 days) remained about the same (24%) (Figure 10).

**(Cause-specific infant death information will be available in the upcoming report, *Massachusetts Deaths 2002*.)**

### **Pregnancy-Associated and Maternal Mortality Ratios**

In 2002, there were 19 pregnancy-associated deaths, including 2 maternal deaths (Fig. 11). A pregnancy-associated death is the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. Women who die from a cause related to pregnancy or childbirth either during pregnancy or up to 42 days after pregnancy termination are called maternal deaths and are a subset of pregnancy-associated deaths. (See technical notes for further information).

The 2002 pregnancy-associated mortality ratio (PAMR) was 23.3 deaths per 100,000 live births and the maternal mortality ratio (MMR) was 2.4 per 100,000 live births (Figure 11). Since 1990, the annual PAMR fluctuated from a low of 18.0 in 1990 to a high of 32.8 in 2001. However, due to the small number of cases, the differences are not statistically significant.

*Note: This year we have improved our methodology for finding cases for 1999 to 2002, so numbers for these years differ from previously published numbers.*

**Table 12A. Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race<sup>1</sup>, Massachusetts: 1980-2002**

<b>INFANT MORTALITY</b> (less than one year of age)								
<b>Year</b>	<b>State Total<sup>2</sup></b>		<b>White</b>		<b>Black</b>		<b>Asian/Other<sup>3</sup></b>	
	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate</b>
<b>1980</b>	748	10.3	655	9.8	87	18.6	5	4.6
<b>1981</b>	710	9.6	616	9.1	85	18.2	8	6.1
<b>1982</b>	764	10.1	656	9.4	102	21.3	5	3.3
<b>1983</b>	682	9.0	579	8.3	89	19.0	12	7.4
<b>1984</b>	699	8.9	601	8.4	82	16.4	13	7.5
<b>1985</b>	745	9.1	608	8.1	126	23.8	11	6.1
<b>1986</b>	695	8.4	560	7.5	123	22.0	11	4.6
<b>1987</b>	608	7.2	486	6.4	110	17.5	12	4.5
<b>1988</b>	693	7.9	546	7.0	133	19.5	13	3.8
<b>1989</b>	697	7.6	549	6.8	131	17.7	17	4.8
<b>1990</b>	649	7.0	519	6.4	106	13.7	24	6.5
<b>1991</b>	577	6.5	461	6.0	102	13.8	14	3.9
<b>1992</b>	569	6.5	438	5.7	114	15.8	17	4.7
<b>1993</b>	523	6.2	423	5.7	87	12.5	13	3.5
<b>1994</b>	499	6.0	407	5.6	81	12.0	11	2.9
<b>1995</b>	419	5.1	333	4.7	65	10.3	21	5.5
<b>1996</b>	403	5.0	329	4.7	65	10.8	8	2.0
<b>1997</b>	425	5.3	349	5.0	66	10.6	10	2.4
<b>1998</b>	414	5.1	345	4.9	59	9.3	10	2.3
<b>1999</b>	418	5.2	334	4.8	75	11.4	9	1.9
<b>2000</b>	377	4.6	280	4.0	76	11.7	19	3.6
<b>2001</b>	407	5.0	314	4.5	77	11.7	16	3.0
<b>2002</b>	397	4.9	306	4.5	74	11.1	17	2.9

**Table 12A (cont'd). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race<sup>1</sup>, Massachusetts: 1980-2002**

<b>NEONATAL MORTALITY (birth to 27 days)</b>								
<b>Year</b>	<b>State Total<sup>2</sup></b>		<b>White</b>		<b>Black</b>		<b>Asian/Other<sup>3</sup></b>	
	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>
<b>1980</b>	550	7.6	483	7.2	62	13.3	5	4.6
<b>1981</b>	510	6.9	442	6.5	59	12.4	5	3.8
<b>1982</b>	573	7.6	494	7.1	75	15.7	3	-- <sup>5</sup>
<b>1983</b>	482	6.3	411	5.9	63	13.4	7	4.3
<b>1984</b>	472	6.0	411	5.8	49	9.8	8	4.6
<b>1985</b>	538	6.6	447	6.0	85	16.0	5	2.8
<b>1986</b>	478	5.8	383	5.2	89	15.9	5	2.1
<b>1987</b>	432	5.1	343	4.6	80	12.7	9	3.4
<b>1988</b>	477	5.4	383	4.9	87	12.8	6	1.8
<b>1989</b>	479	5.2	376	4.7	95	12.8	8	2.3
<b>1990</b>	446	4.8	347	4.3	80	10.3	9	5.1
<b>1991</b>	401	4.5	319	4.1	72	9.8	10	2.8
<b>1992</b>	415	4.8	325	4.3	79	10.9	11	3.1
<b>1993</b>	375	4.4	300	4.1	66	9.5	9	2.4
<b>1994</b>	349	4.2	280	3.8	60	8.9	9	2.4
<b>1995</b>	298	3.6	237	3.3	50	7.9	11	2.9
<b>1996</b>	290	3.6	249	3.5	35	5.8	5	1.2
<b>1997</b>	323	4.0	271	3.9	45	7.2	7	1.7
<b>1998</b>	315	3.9	261	3.7	47	7.4	7	1.6
<b>1999</b>	332	4.1	265	3.8	61	9.3	6	1.3
<b>2000</b>	288	3.5	214	3.1	58	8.9	14	2.7
<b>2001</b>	308	3.8	239	3.5	59	9.0	10	1.9
<b>2002</b>	299	3.7	235	3.4	51	7.6	13	2.2



**Table 12A (cont'd). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race<sup>1</sup>, Massachusetts: 1980-2002**

<b>POST NEONATAL MORTALITY (28-364 days)</b>								
<b>Year</b>	<b>State Total<sup>2</sup></b>		<b>White</b>		<b>Black</b>		<b>Asian/Other<sup>3</sup></b>	
	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>	<b>n</b>	<b>Rate<sup>4</sup></b>
<b>1980</b>	198	2.7	172	2.6	25	5.3	0	0.0
<b>1981</b>	200	2.7	174	2.6	26	5.8	3	-- <sup>5</sup>
<b>1982</b>	191	2.5	162	2.3	27	5.6	2	-- <sup>5</sup>
<b>1983</b>	200	2.7	168	2.4	26	5.6	5	3.1
<b>1984</b>	227	2.9	190	2.6	33	6.6	5	2.9
<b>1985</b>	207	2.5	161	2.1	41	7.8	6	3.3
<b>1986</b>	217	2.6	177	2.3	34	6.1	6	2.5
<b>1987</b>	176	2.1	143	1.8	30	4.8	3	-- <sup>5</sup>
<b>1988</b>	216	2.5	163	2.1	46	6.7	7	2.0
<b>1989</b>	218	2.4	173	2.1	36	4.9	9	2.5
<b>1990</b>	203	2.2	172	2.1	26	3.4	5	1.4
<b>1991</b>	176	2.0	142	1.8	30	4.1	4	-- <sup>5</sup>
<b>1992</b>	154	1.8	113	1.5	35	4.8	6	1.7
<b>1993</b>	148	1.7	123	1.7	21	3.0	4	-- <sup>5</sup>
<b>1994</b>	150	1.8	127	1.7	21	3.1	2	-- <sup>5</sup>
<b>1995</b>	121	1.5	96	1.3	15	2.4	10	2.6
<b>1996</b>	113	1.4	80	1.1	30	5.0	3	-- <sup>5</sup>
<b>1997</b>	102	1.3	78	1.1	21	3.4	3	-- <sup>5</sup>
<b>1998</b>	99	1.2	84	1.2	12	1.9	3	-- <sup>5</sup>
<b>1999</b>	86	1.1	69	1.0	14	2.1	3	-- <sup>5</sup>
<b>2000</b>	89	1.1	66	0.9	18	2.8	5	1.0
<b>2001</b>	99	1.2	75	1.1	18	2.7	6	1.1
<b>2002</b>	98	1.2	71	1.0	23	3.4	4	-- <sup>5</sup>

1. Hispanic origin could not be identified from the Massachusetts death certificate before 1989; thus, Hispanic trend data are not available. Most Hispanics are included in the race category of white. Hispanic infant mortality data for the years 1990 through 2002 are presented in Table 12B. 2. Deaths of infants of unknown race are included in the total calculation. For rate computations, infants of unknown race are allocated into the race categories according to the distribution of births of known race. 3. Other: American Indian and Other races. 4. Rates are expressed per 1,000 live births. 5. Calculations based on fewer than five events are excluded.

**Table 12B. Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race and Hispanic Ethnicity, Massachusetts: 1990-2002**

**INFANT MORTALITY** (less than one year of age)

Year	State Total <sup>1</sup>		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other <sup>2</sup>	
	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>
1990	649	7.0	442	6.1	98	13.7	77	9.1	24	7.0	8	9.5
1991	577	6.5	381	5.5	101	15.0	80	9.4	14	4.2	1	-- <sup>4</sup>
1992	569	6.5	371	5.5	110	16.4	67	7.9	16	4.9	5	5.1
1993	523	6.2	346	5.3	84	13.1	77	9.3	13	3.9	3	-- <sup>4</sup>
1994	499	6.0	343	5.3	79	12.6	64	7.6	8	2.4	5	5.3
1995	419	5.1	275	4.4	65	11.1	58	7.2	19	5.5	2	-- <sup>4</sup>
1996	403	5.0	289	4.7	63	11.4	40	5.1	8	2.2	2	-- <sup>4</sup>
1997	425	5.3	294	4.8	64	11.7	55	6.7	10	2.6	2	-- <sup>4</sup>
1998	414	5.1	287	4.6	59	10.6	58	6.7	10	2.7	0	0.0
1999	418	5.2	285	4.7	72	12.3	49	5.5	8	1.9	4	-- <sup>4</sup>
2000	377	4.6	232	3.8	74	12.8	48	5.2	19	4.1	4	-- <sup>4</sup>
2001	407	5.0	245	4.1	71	12.1	69	7.3	15	3.1	7	4.1
2002	397	4.9	239	4.1	69	11.6	67	7.0	16	3.0	6	3.8

**NEONATAL MORTALITY** (birth to 27 days)

Year	State Total <sup>1</sup>		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other <sup>2</sup>	
	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>
1990	446	4.8	298	4.1	75	10.5	49	5.8	19	5.5	5	5.5
1991	401	4.5	266	3.9	72	10.7	53	6.2	10	3.0	0	0.0
1992	415	4.8	274	4.0	76	11.4	51	6.0	10	3.0	4	-- <sup>4</sup>
1993	375	4.4	245	3.7	64	10.0	55	6.7	9	2.7	2	-- <sup>4</sup>
1994	349	4.2	240	3.7	58	9.3	40	4.7	7	2.1	4	-- <sup>4</sup>
1995	298	3.6	198	3.1	50	8.5	39	4.8	10	2.9	1	-- <sup>4</sup>
1996	290	3.6	222	3.6	34	6.2	27	3.5	5	1.4	1	-- <sup>4</sup>
1997	323	4.0	228	3.7	44	8.0	43	5.2	7	1.8	1	-- <sup>4</sup>
1998	315	3.9	218	3.5	47	8.5	43	5.0	7	1.9	0	0.0
1999	332	4.1	226	3.7	58	9.9	39	4.4	5	1.2	4	-- <sup>4</sup>
2000	288	3.5	177	2.9	57	9.9	37	4.0	14	3.0	3	-- <sup>4</sup>
2001	308	3.8	190	3.2	56	9.5	49	5.2	10	2.1	3	-- <sup>4</sup>
2002	299	3.7	185	3.2	49	8.2	50	5.2	13	2.4	2	-- <sup>4</sup>

**Table 12B (cont.). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race and Hispanic Ethnicity, Massachusetts: 1990-2002**

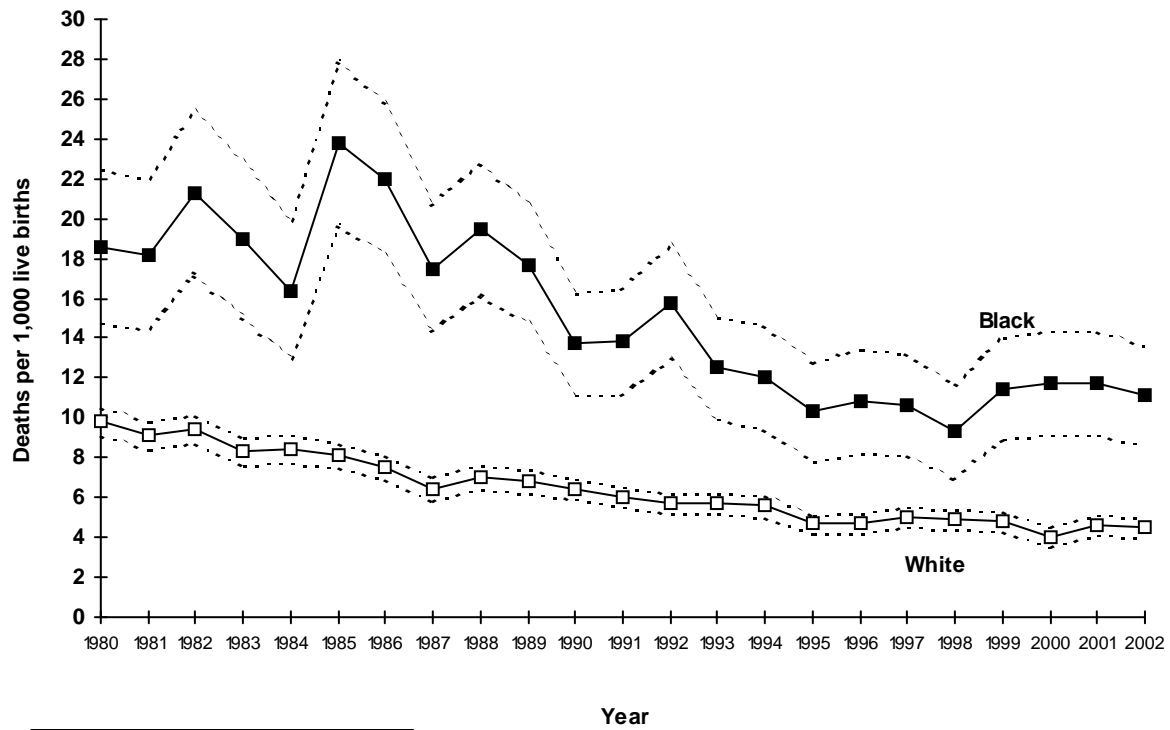
**POST NEONATAL MORTALITY (28-364 days)**

Year	State Total <sup>1</sup>		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other <sup>2</sup>	
	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>	n	Rate <sup>3</sup>
1990	203	2.2	144	2.0	23	3.2	28	3.3	5	1.5	3	-- <sup>4</sup>
1991	176	2.0	115	1.7	29	4.3	27	3.2	4	-- <sup>4</sup>	1	-- <sup>4</sup>
1992	154	1.8	97	1.4	34	5.1	16	1.9	6	1.8	1	-- <sup>4</sup>
1993	148	1.7	101	1.5	20	3.1	22	2.7	4	-- <sup>4</sup>	1	-- <sup>4</sup>
1994	150	1.8	103	1.6	21	3.3	24	2.8	1	-- <sup>4</sup>	1	-- <sup>4</sup>
1995	121	1.5	77	1.2	15	2.6	19	2.3	9	2.6	1	-- <sup>4</sup>
1996	113	1.4	67	1.1	29	5.3	13	1.7	3	-- <sup>4</sup>	1	-- <sup>4</sup>
1997	102	1.3	66	1.1	20	3.7	12	1.5	3	-- <sup>4</sup>	1	-- <sup>4</sup>
1998	99	1.2	69	1.1	12	2.2	15	1.7	3	-- <sup>4</sup>	0	0.0
1999	86	1.1	59	1.0	14	2.4	10	1.1	3	-- <sup>4</sup>	0	0.0
2000	89	1.1	55	0.9	17	2.9	11	1.2	5	1.1	1	-- <sup>4</sup>
2001	99	1.2	55	0.9	15	2.6	20	2.1	5	1.0	4	-- <sup>4</sup>
2002	98	1.2	54	0.9	20	3.4	17	1.8	3	-- <sup>4</sup>	4	-- <sup>4</sup>

1. Deaths of infants of unknown race are included in the total calculation. For rate computations, births of infants of unknown race are allocated into the race categories according to the distribution of births of known race. 2. Other: American Indian and Other races. 3. Rates are expressed per 1,000 live births.

4. Calculations based on fewer than five events are excluded.

**Figure 8. Infant Mortality Rates and 95% Confidence Intervals<sup>1</sup>  
by Race<sup>2</sup>, Massachusetts: 1980-2002**

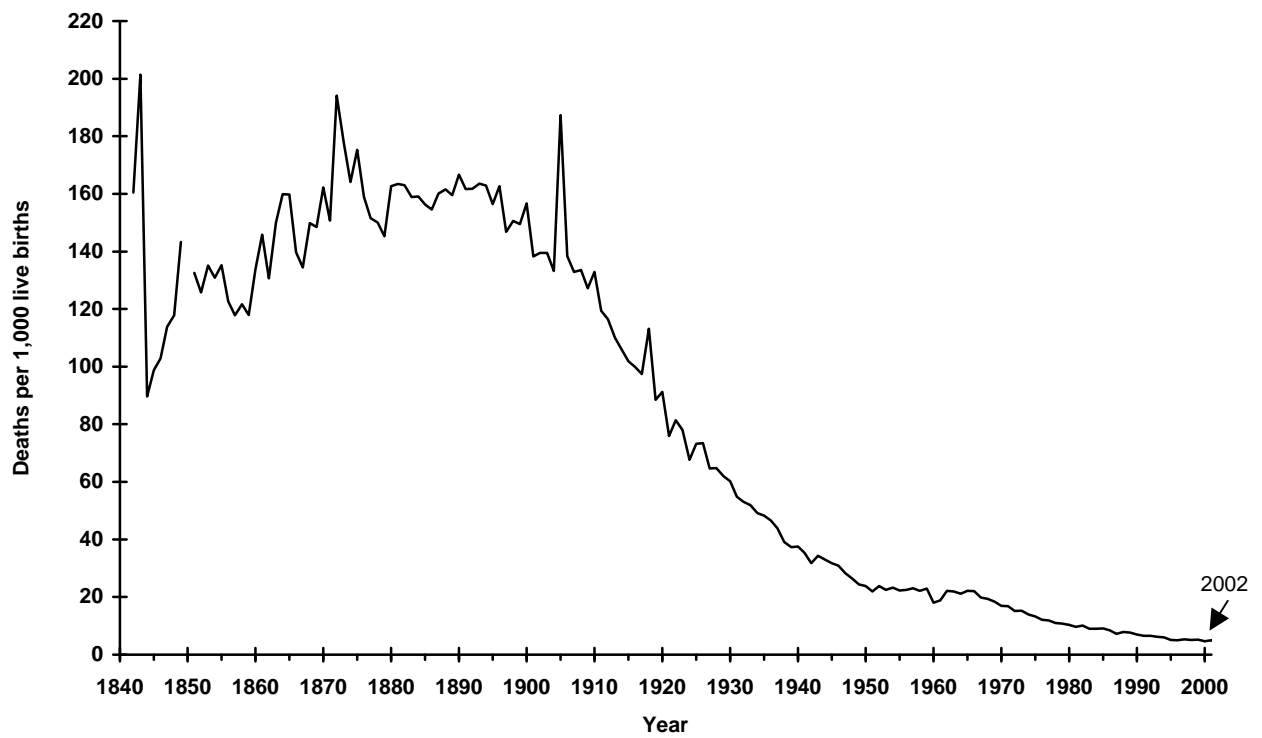


<sup>1</sup>See Appendix for explanation.

<sup>2</sup>For rate computations, infant births of unknown race are allocated into race categories according to the distribution of the births of known race.

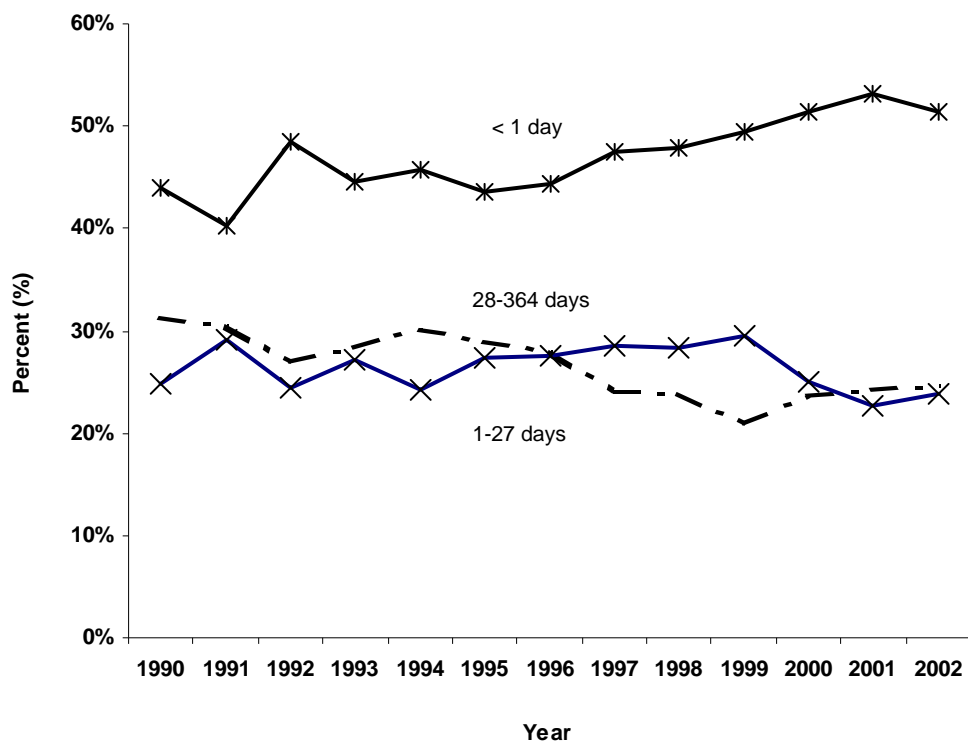
<sup>3</sup>On tables and graphs, which include data prior to June 1989, the race classifications do not include ethnicity; most Hispanics are included in the race category of whites.

Figure 9. Infant Mortality Rates, Massachusetts: 1842-2002<sup>1</sup>

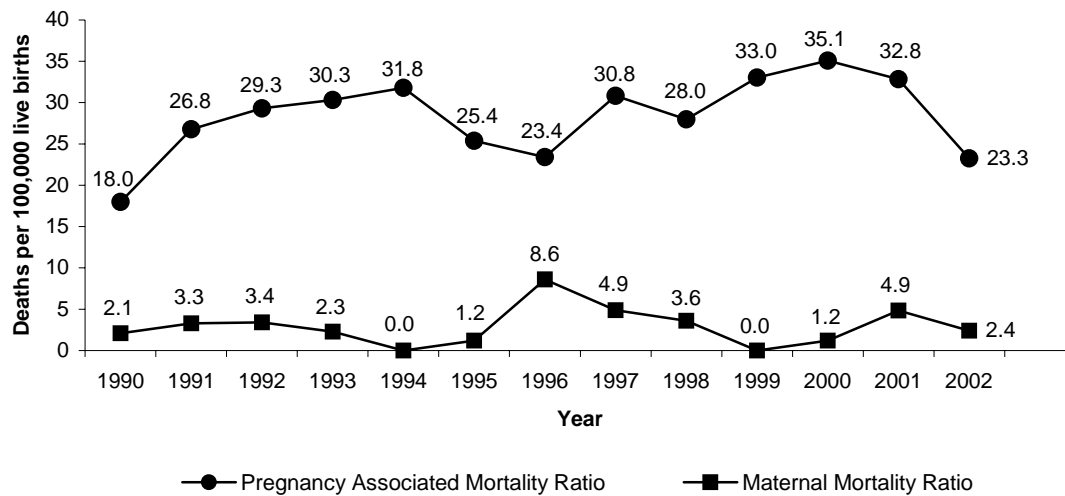


1. Data not available for 1850.

Figure 10. Trends in the Timing of Infant Deaths, 1990-2002



**Figure 11. Trends in Pregnancy-Associated<sup>1</sup> and Maternal Mortality<sup>2</sup>,  
Massachusetts: 1990-2002**



**Number of Pregnancy-Associated<sup>1</sup> and Maternal Deaths<sup>2</sup>, 1990-2002**

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Pregnancy-Associated Deaths <sup>1</sup>	17	24	26	26	27	21	19	25	23	27	29	27	19
Maternal Deaths <sup>2</sup>	2	3	3	2	0	1	7	4	3	0	1	4	2

NOTE: Ratios shown in graph are per 100,000 live births. Ratios are based on occurrence births, not resident births.

1. Pregnancy-associated death is defined as the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. The pregnancy-associated mortality ratio is the number of pregnancy-associated deaths per 100,000 live occurrence births (see Definition of Rates and Technical Notes in Appendix for further information). 2. Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes. Maternal mortality ratio is the number of maternal deaths per 100,000 live occurrence births (see Definition of Rates and Technical Notes in Appendix for more information.)





## **CHAPTER 4**

### **BIRTHWEIGHT AND GESTATIONAL AGE**



## Overall Birthweight Distribution

In 2002, 7.5% (6,060) of Massachusetts resident infants were low birthweight (LBW) (less than 2,500 grams or 5.5 pounds), and 11.2% were 4,000 grams (8.8 pounds) or more (Table 13).

The low birthweight percentage increased 4%, from 7.2% in 2001 to 7.5% in 2002, **the highest since at least 1980** (Table 15). In 2002, 1.4% (1,109) of infants born to Massachusetts resident women were very low birthweight (VLBW) (less than 1,500 grams or 3.3 pounds); this percentage has remained the same since 1999.

The increase in low birthweight infants can be linked directly to the increase in multiple births and the aging of the population giving birth. The trend in low birthweight infants in Massachusetts is consistent with national trends.

The low birthweight rate in Massachusetts was 4% below the U.S. rate of 7.8% (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2).

## Patterns of Birthweight by Race and Ethnicity

The proportion of low birthweight infants varied by mother's race and ethnicity (Table 13). Black non-Hispanic women had the highest proportion of low birthweight infants: 12.6%; Hispanic mothers delivered 8.3% low birthweight infants; Asian mothers, 8.0% low birthweight infants; and white non-Hispanic mothers delivered 6.8% low birthweight infants.

The proportion of low birthweight deliveries in 2002 increased for all major race and ethnic groups: the rate for black non-Hispanics increased 13% from 11.2% to 12.6%, the rate for Asians increased by 10% from 7.3% to 8.0%, the rate for white non-Hispanics increased 3% from 6.6% to 6.8%, and the rate for Hispanics increased 1% from 8.2% to 8.3% (data not shown).

The proportion of very low birthweight infants also varied by mother's race and ethnicity. Black non-Hispanic women had the highest proportion of very low birthweight infants: 3.1%; compared with 1.7% of Hispanics, 1.4% of Asians, and 1.1% of white non-Hispanics (Table 13).

White non-Hispanic mothers delivered the highest proportion of high birthweight infants (weighed 4,000 grams or 8.8 pounds and more): 12.6% (Table 13). This is a decrease from 2001, when the rate for white non-Hispanic mothers was 12.8% (data not shown).

The Massachusetts 2002 low birthweight rate for black non-Hispanic women, 12.6%, was lower than the U.S. rate for all black women, 13.3%. The rate of low birthweight for Massachusetts Hispanic women (8.3%) was higher than the corresponding 2002 U.S. rate of 6.5% (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 2). This may be due to differences in the composition of the Hispanic population between Massachusetts and the nation as a whole. In Massachusetts, the Hispanic population is comprised mainly of Puerto Ricans, Dominicans, and Central Americans. The U.S. Hispanic population has a much greater percentage of Mexicans and Cubans who tend to have relatively lower rates of low birthweight. The Massachusetts low birthweight rate

for Puerto Rican mothers was 10.2% in 2002 (Table 2B), compared with 9.7% among Puerto Rican mothers nationwide in 2002 (National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003, p. 18).

### **Birthweight and Smoking**

Cigarette smoking during pregnancy increases the likelihood of delivering a low birthweight infant. During 2002 in Massachusetts, 11% of infants born to mothers who smoked during pregnancy were low birthweight, compared with 7% of infants born to non-smoking mothers (Figure 12). Approximately 1 out of 6 (16%) infants born to black non-Hispanic women who smoked during their pregnancies were low birthweight.

### **Birthweight and Age of Mother**

In general, the relation between mother's age and percentage low birthweight follows a "U-shaped" distribution: the percentage of low birthweight deliveries is highest among both the youngest mothers (under age 24 years) and the oldest mothers (over age 35 years), while it is lowest for mothers between 25 and 34 years of age (Table 14).

### **Low Birthweight and Plurality**

The increase in low birthweight in Massachusetts over the past decade can be attributed in part to the dramatic increase in multiple births in Massachusetts. The percentage of low birthweight (LBW) and very low birthweight (VLBW) rises dramatically for twins and higher order births. In 2002, 5% of singleton births were LBW, whereas half of twins, and 96% of higher order births were LBW (Table 15). Similarly, 0.9% of singletons, 9% of twins, and 28% of higher order births were VLBW. The percentage of VLBW singleton infants remained approximately the same from 1992 to 2002, while LBW increased 11% in this group: 4.7% in 1992 to 5.2% in 2002. The percentage of LBW deliveries for twins also increased slightly from 2001 to 2002.

### **Preterm Deliveries**

In 2002, 8.5% (6,795) of infants born to Massachusetts resident women were preterm (premature, that is, born before the mother had completed the 37th week of pregnancy) (Table 16). This was an increase of 2% from the previous year.

The proportion of preterm births varied by mother's race and ethnicity. Black non-Hispanic women had the highest proportion of preterm infants, 12.3%. Hispanic women had 8.9% preterm births; white non-Hispanic women, 8.1%; and Asian women had the lowest, 7.6% (Table 16).

The percentage of infants delivered very early (before the 28<sup>th</sup> week of gestation) has remained the same since 1997 at 0.6%. Black non-Hispanic women had the highest proportion of infants delivered very early (1.7%) more than double that of any other racial and ethnic group (Table 16).

Table 13. Births by Birthweight, Race and Hispanic Ethnicity, Massachusetts: 2002

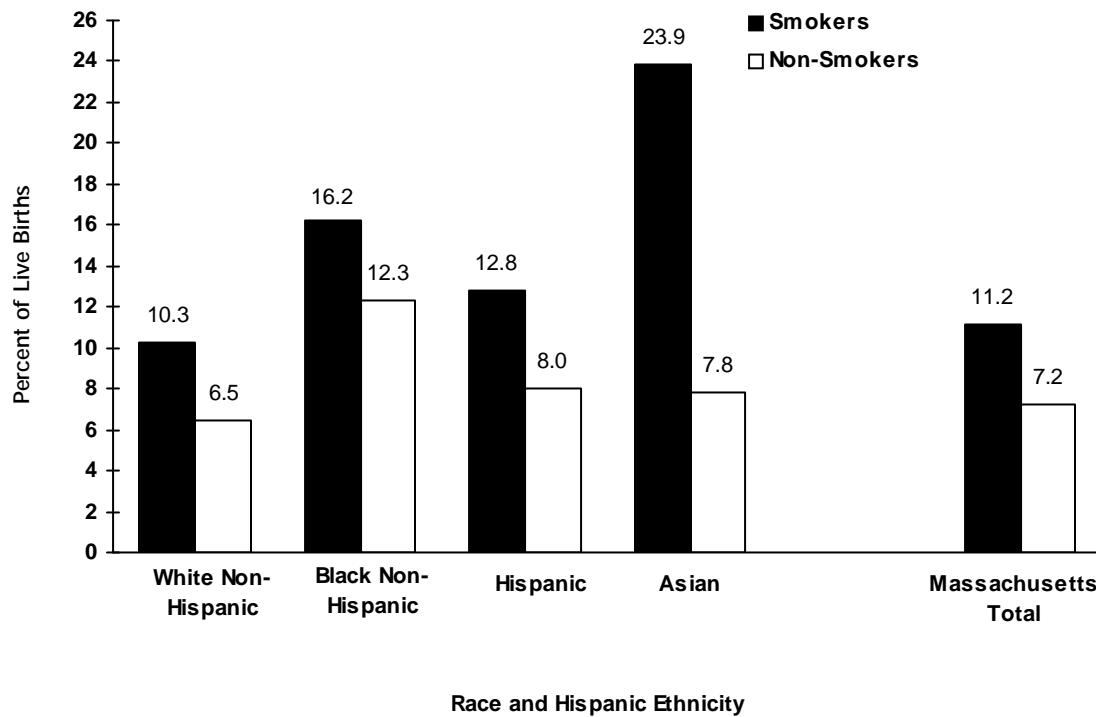
Birthweight (in grams)	Total		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other		Unknown
	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	n	% <sup>1</sup>	
<b>State Total</b>	80,624	100.0	58,136	100.0	5,948	100.0	9,543	100.0	5,300	100.0	1,576	100.0	121
<b>&lt;500</b>	125	0.2	54	0.1	32	0.5	26	0.3	9	0.2	4	-- <sup>2</sup>	0
<b>500-999</b>	417	0.5	238	0.4	80	1.3	63	0.7	25	0.5	10	0.6	1
<b>1000-1499</b>	567	0.7	374	0.6	70	1.2	73	0.8	42	0.8	8	0.5	0
<b>1500-1999</b>	1,207	1.5	831	1.4	134	2.3	143	1.5	66	1.2	31	2.0	2
<b>2000-2499</b>	3,744	4.6	2,455	4.2	431	7.2	487	5.1	282	5.3	84	5.3	5
<b>2500-2999</b>	12,091	15.0	7,676	13.2	1,233	20.7	1,735	18.2	1,162	21.9	273	17.3	12
<b>3000-3499</b>	29,219	36.2	20,350	35.0	2,188	36.8	3,822	40.1	2,242	42.3	596	37.8	21
<b>3500-3999</b>	24,184	30.0	18,770	32.3	1,347	22.6	2,421	25.4	1,187	22.4	432	27.4	27
<b>4000-4499</b>	7,559	9.4	6,207	10.7	342	5.7	650	6.8	235	4.4	118	7.5	7
<b>4500-4999</b>	1,255	1.6	1,011	1.7	75	1.3	105	1.1	44	0.8	14	0.9	6
<b>&gt;=5000</b>	129	0.2	107	0.2	6	0.1	9	0.1	5	0.1	2	-- <sup>2</sup>	0
<b>Unknown</b>	127	0.2	63	0.1	10	0.2	9	0.1	1	-- <sup>2</sup>	4	-- <sup>2</sup>	40
<b>VLBW<sup>3</sup> (0-1,499 g)</b>	1,109	1.4	666	1.1	182	3.1	162	1.7	76	1.4	22	1.4	1
<b>LBW<sup>4</sup> (0-2,499 g)</b>	6,060	7.5	3,952	6.8	747	12.6	792	8.3	424	8.0	137	8.7	8

NOTE: Percentages for detailed birthweight rows ("<500" through "Unknown") are calculated based on all births including those with unknown birthweight. Percentages for VLBW and LBW rows are calculated based on births with known birthweights only.

1. Percentages are based on column totals. 2. Calculations based on fewer than five events are excluded. 3. Very Low Birthweight (VLBW): less than 1,500 grams (3.3 lbs.).

4. Low Birthweight (LBW): less than 2,500 grams (5.5 lbs.).

**Figure 12. Low Birthweight<sup>1</sup> Among Smoking and Nonsmoking<sup>2</sup> Mothers, by Race and Hispanic Ethnicity, Massachusetts: 2002**



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Maternal smoking is self-reported, usually following childbirth; these data should be interpreted cautiously.

1. Low birthweight: less than 2,500 grams or 5.5 pounds.

2. Based on information provided on the birth certificate by the mother.

**Table 14. Low Birthweight (LBW)<sup>1</sup> by Maternal Age, Race and Hispanic Ethnicity, Massachusetts: 2002**

Mother's Age (in years)	Total LBW Infants		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other <sup>4</sup>		Unknown <sup>5</sup>
	n	% <sup>3</sup>	n	% <sup>3</sup>	n	% <sup>3</sup>	n	% <sup>3</sup>	n	% <sup>3</sup>	n	% <sup>3</sup>	
<b>State Total<sup>2</sup></b>	<b>6,060</b>	<b>7.5</b>	<b>3,951</b>	<b>6.8</b>	<b>747</b>	<b>12.6</b>	<b>792</b>	<b>8.3</b>	<b>424</b>	<b>8.0</b>	<b>137</b>	<b>8.7</b>	<b>9</b>
<b>&lt;18</b>	184	11.7	56	9.4	41	17.9	67	11.0	13	16.3	7	12.5	0
<b>18-19</b>	303	9.6	121	7.7	49	12.2	103	10.8	17	13.5	12	12.6	1
<b>20-24</b>	889	7.5	434	6.6	160	12.3	203	6.9	58	9.1	34	8.6	0
<b>25-29</b>	1,262	6.8	752	5.9	179	12.1	193	8.0	103	6.8	31	7.5	4
<b>30-34</b>	1,845	6.8	1,362	6.3	175	12.1	139	8.2	136	7.0	33	9.0	0
<b>35-39</b>	1,243	8.2	969	7.8	108	12.7	69	8.8	79	9.4	16	7.6	2
<b>40+</b>	333	10.2	257	9.7	35	14.3	18	11.2	18	11.0	4	10.5	1

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Low Birthweight (LBW): less than 2,500 grams or 5.5 pounds at birth. 2. State totals include women of unknown age. 3. Percentages are based upon the number of low birthweight infants divided by the total births in each age and race/ethnicity category. 4. Other races include American Indian and others not specified. 5. Race and/or mother's age unknown.

**Table 15. Low Birthweight by Plurality, Massachusetts: 1992-2002**

Age Group	Year	Singleton				Multiples												Total Births			
						Twin				Triplets or more				Total Multiples							
		VLBW <sup>1</sup>		LBW <sup>2</sup>		VLBW <sup>1</sup>		LBW <sup>2</sup>		VLBW <sup>1</sup>		LBW <sup>2</sup>		VLBW <sup>1</sup>		LBW <sup>2</sup>		VLBW <sup>1</sup>		LBW <sup>2</sup>	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All Ages	1992	656	0.8	3,959	4.7	192	8.3	1,062	45.7	39	29.8	116	88.5	231	9.4	1,178	48.0	887	1.0	5,137	5.9
	1993	673	0.8	3,919	4.8	216	9.2	1,105	47.1	73	36.0	178	87.7	289	11.3	1,283	50.4	962	1.1	5,202	6.2
	1994	687	0.8	4,015	5.0	223	9.5	1,122	47.9	66	30.8	198	92.5	289	11.3	1,320	51.6	976	1.2	5,335	6.4
	1995	674	0.9	3,867	4.9	227	9.4	1,128	46.6	63	31.8	179	90.4	290	11.1	1,307	49.9	964	1.2	5,174	6.4
	1996	657	0.9	3,674	4.8	227	8.8	1,264	49.1	45	24.5	167	90.8	272	9.9	1,431	51.9	929	1.2	5,105	6.4
	1997	731	0.9	3,938	5.1	292	10.3	1,439	50.5	75	28.6	240	91.6	367	11.8	1,679	54.0	1,098	1.4	5,617	7.0
	1998	690	0.9	3,819	4.9	298	9.6	1,570	50.7	82	28.5	266	92.4	380	11.2	1,836	54.2	1,070	1.3	5,655	7.0
	1999	731	0.9	3,869	5.0	324	10.3	1,617	51.6	65	26.5	222	90.6	389	11.5	1,839	54.5	1,120	1.4	5,708	7.1
	2000	722	0.9	3,886	5.1	284	8.9	1,603	50.0	84	35.0	222	92.5	368	10.7	1,825	53.0	1,090	1.4	5,711	7.1
	2001	730	0.9	3,931	5.1	310	9.2	1,654	49.2	74	32.9	210	93.3	384	10.7	1,864	52.0	1,114	1.4	5,795	7.2
	2002	699	0.9	3,972	5.2	342	9.2	1,855	50.2	68	28.0	233	95.9	410	10.4	2,088	53.0	1,109	1.4	6,060	7.5
Ages < 35	1992	551	0.8	3,378	4.6	166	8.8	870	46.0	29	28.7	92	91.1	195	9.8	962	48.3	746	1.0	4,340	5.8
	1993	561	0.8	3,307	4.7	168	9.2	881	48.2	56	35.9	136	87.2	224	11.3	1,017	51.2	785	1.1	4,324	6.0
	1994	567	0.8	3,397	5.0	181	9.9	891	48.5	47	28.7	150	91.5	228	11.4	1,041	52.0	795	1.1	4,438	6.3
	1995	543	0.8	3,187	4.9	196	11.0	852	47.9	52	36.9	135	95.7	248	12.9	987	51.4	791	1.2	4,174	6.2
	1996	501	0.8	2,937	4.7	194	10.2	944	49.9	32	27.1	111	94.1	226	11.2	1,055	52.5	727	1.1	3,992	6.1
	1997	566	0.9	3,179	5.1	214	11.0	1,030	53.0	46	27.1	153	90.0	260	12.3	1,183	55.9	826	1.3	4,362	6.8
	1998	540	0.9	3,086	4.9	248	11.4	1,148	52.5	60	35.3	153	90.0	308	13.1	1,301	55.2	848	1.3	4,387	6.8
	1999	569	0.9	3,082	5.0	231	10.8	1,124	52.6	49	32.9	138	92.6	280	12.3	1,262	55.2	849	1.3	4,344	6.8
	2000	555	0.9	3,096	5.1	204	9.4	1,097	50.7	49	38.0	125	96.9	253	11.0	1,222	53.3	808	1.3	4,318	6.9
	2001	576	1.0	3,147	5.2	235	10.7	1,156	52.4	41	31.3	120	91.6	276	11.8	1,276	54.6	852	1.4	4,423	7.0
	2002	537	0.9	3,129	5.2	237	10.0	1,229	51.9	42	33.1	125	98.4	279	11.2	1,354	54.2	816	1.3	4,483	7.2
Ages 35+	1992	104	0.9	580	5.0	26	6.0	192	44.4	10	33.3	24	80.0	36	7.8	216	46.8	140	1.2	796	6.6
	1993	112	0.9	612	5.1	48	9.3	224	43.4	17	36.2	42	89.4	65	11.5	266	47.2	177	1.4	878	7.0
	1994	120	1.0	618	4.9	42	8.3	231	45.6	19	38.0	48	96.0	61	11.0	279	50.1	181	1.4	897	6.9
	1995	130	1.0	679	5.1	31	4.8	276	43.0	11	19.3	44	77.2	42	6.0	320	45.8	172	1.2	999	7.2
	1996	156	1.1	737	5.4	33	4.9	320	47.1	13	19.7	56	84.8	46	6.2	376	50.5	202	1.4	1,113	7.7
	1997	165	1.1	759	5.2	78	8.6	409	45.3	29	31.5	87	94.6	107	10.8	496	49.9	272	1.7	1,255	8.1
	1998	150	1.0	733	4.8	50	5.5	422	46.2	22	18.6	113	95.8	72	7.0	535	51.8	222	1.4	1,268	7.8
	1999	162	1.0	787	5.0	93	9.3	493	49.5	16	16.7	84	87.5	109	10.0	577	52.8	271	1.6	1,364	8.2
	2000	167	1.0	790	4.9	80	7.7	506	48.6	35	31.5	97	87.4	115	10.0	603	52.3	282	1.6	1,393	8.1
	2001	154	0.9	784	4.7	75	6.5	498	43.2	33	35.1	90	95.7	108	8.7	588	47.2	262	1.5	1,372	7.7
	2002	161	1.0	842	5.0	105	7.9	626	47.1	26	22.4	108	93.1	131	9.1	734	50.8	292	1.6	1,576	8.6

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Very Low Birthweight (VLBW): less than 1,500 grams (3.3 lbs.). 2. Low Birthweight (LBW): less than 2,500 grams (5.5 lbs.). 3. Calculations based on fewer than five events are excluded.



Table 16. Births by Gestational Age<sup>1</sup>, Race and Hispanic Ethnicity, Massachusetts: 2002

Gestational Age (weeks completed)	Total		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other <sup>3</sup>		Unknown
	n	% <sup>2</sup>	n	% <sup>2</sup>	n	% <sup>2</sup>	n	% <sup>2</sup>	n	% <sup>2</sup>	n	% <sup>2</sup>	n
<b>State Total</b>	80,624	100.0	58,136	100.0	5,948	100.0	9,543	100.0	5,300	100.0	1,576	100.0	121
<b>&lt;20</b>	19	0.0	4	-- <sup>7</sup>	7	0.1	5	0.1	1	-- <sup>7</sup>	2	-- <sup>7</sup>	0
<b>20-23</b>	163	0.2	89	0.2	42	0.7	20	0.2	11	0.2	1	-- <sup>7</sup>	0
<b>24-27</b>	330	0.4	186	0.3	53	0.9	62	0.6	23	0.4	6	0.4	0
<b>28-31</b>	722	0.9	486	0.8	102	1.7	83	0.9	35	0.7	16	1.0	0
<b>32-35</b>	2,990	3.7	2,116	3.6	286	4.8	361	3.8	159	3.0	64	4.1	4
<b>36</b>	2,571	3.2	1,806	3.1	241	4.1	310	3.2	175	3.3	36	2.3	3
<b>37-39<sup>4</sup></b>	36,310	45.0	25,908	44.6	2,704	45.5	4,357	45.7	2,600	49.1	705	44.7	36
<b>40<sup>4</sup></b>	26,283	32.6	19,287	33.2	1,747	29.4	3,052	32.0	1,641	31.0	528	33.5	28
<b>41<sup>4</sup></b>	9,820	12.2	7,323	12.6	629	10.6	1,098	11.5	587	11.1	176	11.2	7
<b>42<sup>4</sup></b>	1,048	1.3	702	1.2	107	1.8	151	1.6	55	1.0	33	2.1	0
<b>43</b>	21	0.0	12	0.0	4	-- <sup>7</sup>	3	-- <sup>7</sup>	2	-- <sup>7</sup>	0	0.0	0
<b>44+</b>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
<b>Unknown<sup>5</sup></b>	347	0.4	217	0.4	26	0.4	41	0.4	11	0.2	9	0.6	43
<b>Very early gestation, &lt;28 weeks</b>	512	0.6	279	0.5	102	1.7	87	0.9	35	0.7	9	0.6	0
<b>Preterm, &lt;37 weeks<sup>6</sup></b>	6,795	8.5	4,687	8.1	731	12.3	841	8.9	404	7.6	125	8.0	7

NOTE: Percentages for detailed gestational age category rows ("<20" through "Unknown") are calculated based on all births including those with unknown gestational age. Percentages for "Very early gestation" and "Preterm" rows are calculated based on births with known gestational age only.

1. A clinical estimate of the number of weeks of pregnancy completed; as estimated by the attendant at birth or the postnatal physician. 2. Percentages are based on column total. 3. Other races include American Indian and others not specified. 4. Normal gestational age is defined as 37-42 weeks. 5. Estimate of gestational age not provided. 6. Also known as early gestational age, premature delivery, or preterm delivery. 7. Calculations based on fewer than five events are excluded.



## **CHAPTER 5**

### **ADEQUACY OF PRENATAL CARE**



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## IMPORTANT TECHNICAL NOTE:

### **Change in Adequacy of Prenatal Care Indicator since *Massachusetts Births 2001*:**

(Based on excerpts from "An Overview of the APNCU Index" by Milton Kotelchuck, Sept. 1994, available online at: [http://www.mchlibrary.info/databases/HSNRCPDFs/Overview\\_APCUIndex.pdf](http://www.mchlibrary.info/databases/HSNRCPDFs/Overview_APCUIndex.pdf) accessed December 2003).

#### What is the APNCU Index, and why has it replaced the Kessner Index?

Beginning with last year's publication (*Massachusetts Births 2001*), adequacy of prenatal care is measured with the Adequacy of Prenatal Care Utilization (APNCU) Index instead of the Kessner Index, which has been used in previous *Advance Births* and *Massachusetts Births* publications. The APNCU Index was developed by Milton Kotelchuck, Ph.D. It is the standard used in Healthy People 2010 and by the majority of states. It improves upon the Kessner Index in various ways, the most important being the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to an insufficient number of prenatal care visits. [Please see the Technical Notes in the Appendix for more information on differences between the Kessner Index and the APNCU Index.]

#### What does the APNCU Index measure?

The APNCU Index characterizes prenatal care (PNC) utilization by measuring two distinct components of prenatal care -- adequacy of initiation and adequacy of received services (visits). Each of these components is measured as an independent index, and the APNCU Index is a summary of these 2 component indices. As with the Kessner Index, the APNCU Index does not assess quality of the prenatal care that is delivered, only its utilization.

#### *Component Indices and Summary Index*

The first component index is "**Adequacy of Initiation**," which describes the adequacy of when prenatal care began during pregnancy. The assumption underlying this scale is that the earlier PNC begins the better. The month or trimester prenatal care begins is widely used as a measure to assess the adequacy of timing of initiation of PNC, since it accurately and succinctly describes when PNC begins. The APNCU Index uses this measure to determine the "adequacy of initiation."

The second component index, "**Adequacy of Received Services**" (**visits**), characterizes the adequacy of received PNC visits during the time period after prenatal care is begun until the delivery. This component attempts to characterize if the woman received the appropriate number of prenatal care visits for the time period in which she received PNC services. [The appropriate number of visits is based on recommendations of the American College of Obstetricians and Gynecologists for an uncomplicated pregnancy. For example, a woman beginning prenatal care during the first month of pregnancy who delivers during the 40<sup>th</sup> week of gestation (and has no complications with her pregnancy) should receive 14 visits].

The two component indices are measured independently from one another, and can be used as separate indices, since the policy and practice issues underlying whether women are beginning care early and whether they are receiving the recommended amount of visits may be quite distinct. However, because of the popularity and utility of using one overall adequacy of PNC index, **the two component indices are combined into a single summary index -- the "Adequacy of Prenatal Care Utilization (APNCU) Index."**

### *Index Categories*

Both the two component indices and the summary index (APNCU Index) characterize PNC as one of five categories: “adequate intensive,” “adequate basic,” “intermediate,” “inadequate,” or “unknown.” The category “adequate basic” refers to the minimum recommended level of care (for a pregnancy with no complications), while “adequate intensive” refers to a level of care exceeding recommended standards. **The sum of the “adequate basic” and “adequate intensive” categories is the total adequacy score.** In addition, the “inadequate” category can be subdivided to isolate those women who received no PNC. *[For definitions of categories, please see the Technical Notes in the Appendix.]*

[For more detail on the methodology of the APNCU Index, please call Center for Health Information, Statistics, Research & Evaluation at 617-988-3394].

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### **Changes in Adequacy of Prenatal Care, 1996-2002**

Adequacy of prenatal care as measured by the summary APNCU Index rose slightly by 2% from 1996 to 2002 in Massachusetts. In 1996, 83.3% of Massachusetts mothers received adequate prenatal care; in 2002, 84.7% received adequate prenatal care (Figure 13). Between 2001 and 2002, adequacy rates decreased slightly for white non-Hispanic mothers, and rose slightly for Asian mothers, Hispanic mothers and black non-Hispanic mothers. In 2002, white non-Hispanic women had the highest percentage of adequate prenatal care (87.1%), followed by Asians (81.8%), Hispanics (78.9%), and black non-Hispanics (74.8%).

### **Components of the Adequacy of Prenatal Care Utilization Index**

In Table 17, the two component indices, initiation and received services (visits), as well as the summary APNCU Index, are described. In 2002, the total percentage of mothers receiving adequate prenatal care (“adequate total”) was 84.7%, including 45.2% of mothers who received “adequate basic” prenatal care (they began care in months 1-4 of pregnancy and received 80-109% of the expected number of prenatal visits), and 39.5% of mothers who received “adequate intensive” care (they began care in months 1-4 of pregnancy and received at least 110% of expected number of visits). Approximately 7% of mothers received “intermediate” care (they began care in months 5 or 6 of pregnancy and received 50-70% of expected number of visits). Approximately 1 out of 12 mothers (7.9%) received inadequate prenatal care in Massachusetts in 2002.

In 2002, more than 9 out of 10 Massachusetts mothers (92.8%) had adequate initiation of PNC (Table 17). Half (50.7%) began care in the third or fourth month of pregnancy (“adequate basic” initiation) while 42.1% began care in the first or second month of pregnancy (“adequate intensive” initiation). The sum of these two groups (50.7% + 42.1%) equals the total adequacy score (“adequate total”) of 92.8% on the adequacy of initiation index.

Almost half (46.6%) of mothers had 80-109% of the expected number of prenatal care visits (“adequate basic” visits) (Table 17). In addition, 44.2% of mothers had at least 110% of the expected number of prenatal care visits (“adequate intensive” visits). A total of 90.8% (46.6% + 44.2%) of mothers received an adequate number of prenatal care visits.

### **Adequacy of Prenatal Care Utilization by Selected Maternal and Infant Characteristics**

Adequacy of prenatal care increased with both age and educational level of the mother. Almost 9 out of 10 women ages 30 and above received adequate prenatal care (87.6%); whereas, almost 1 in 4 women less than age 18 had inadequate prenatal care (22.9%) (Table 18). Only 69.6% of women ages 18 and younger received adequate prenatal care. Women with more education were more likely to receive adequate prenatal care: 90.5% of mothers with more than a college degree had adequate prenatal care while only 71.8% of mothers with less than a high school education had adequate prenatal care. White non-Hispanic and Asian mothers had the highest adequacy levels, 87.1% and 81.9% respectively. Black non-Hispanic mothers had the lowest adequacy levels (74.8%). Mothers who smoked during their pregnancies were over twice as likely to have inadequate prenatal care compared to non-smokers, 14.8% vs. 7.3%. Women who had multiple births were much more likely to receive adequate intensive services compared to mothers delivering only one child: 80.9% vs. 37.4%. This no doubt reflects the higher risk and potential complications for delivery of multiple births. Similarly, women who delivered preterm infants (less than 37 weeks of gestation) were much more likely to have adequate intensive prenatal care than women who delivered at full term (37-42 weeks): 75.8% vs. 36.2%.

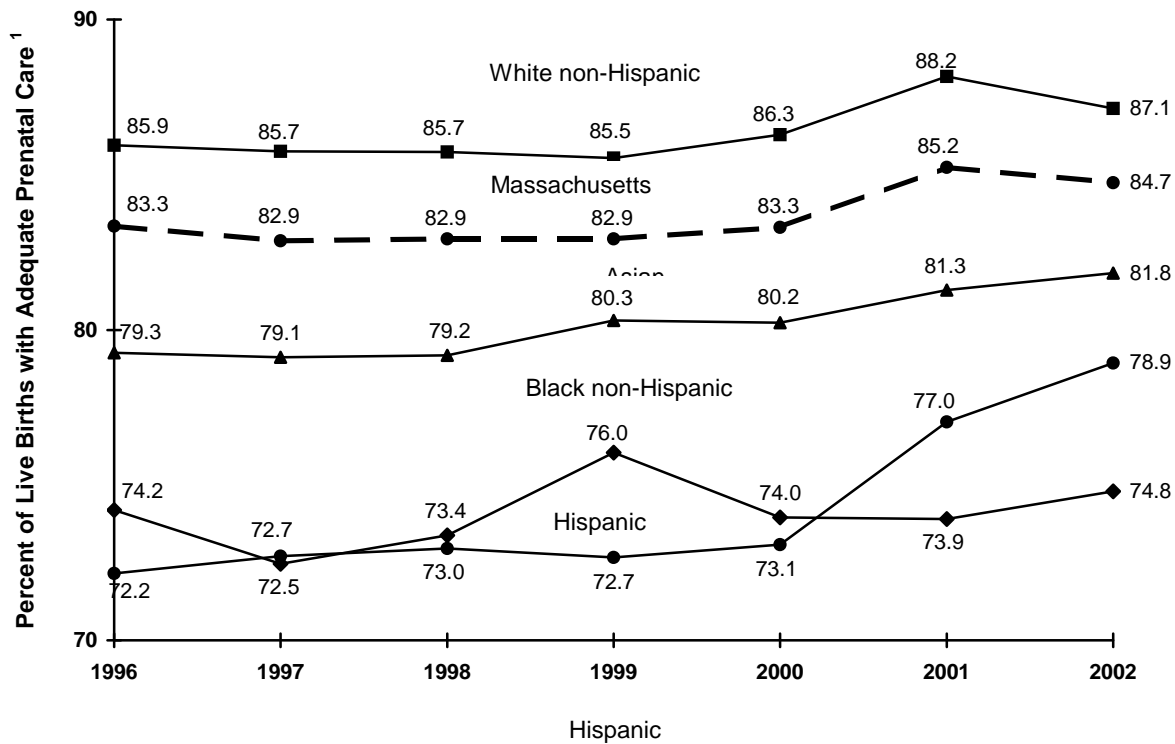
### **Adequacy of Initiation by Selected Maternal and Infant Characteristics**

About 1 in 5 teenage mothers did not start prenatal care until their fifth month of pregnancy or had no prenatal care at all (Table 19) (This is the sum of intermediate and inadequate initiation, which equals 22% for women less than 18 years old and 18% for women age 18-19). Over 95% of mothers age 30 and above began prenatal care in their first four months of pregnancy (as reflected by their adequate total scores in Table 19). White non-Hispanic mothers were more likely to have adequate prenatal care initiation (95.0%) than black non-Hispanic mothers (84.0%), Hispanic women (87.2%), and Asian women (89.9%). Mothers who smoked were over twice as likely to have inadequate prenatal care initiation compared to non-smoking mothers (5.3% vs. 2.3%). Mothers who delivered very low birthweight infants (birthweight less than 1,500 grams) were more likely to enter prenatal care in their first or second month of pregnancy ("adequate intensive") than women who delivered heavier infants.

### **Adequacy of Received Services (Visits) by Selected Maternal and Infant Characteristics**

Older and more-educated mothers had higher proportions of adequate PNC visits than did younger or less educated mothers (Table 20). One exception to this pattern is for women under the age of 18 who had the highest level of adequate intensive prenatal care visits. The proportion of adequate prenatal visits varied slightly by mother's birthplace; U.S.-born mothers had the highest proportion of adequate visits (91.1%), followed by non-U.S. born (90.3%), and mothers born in Puerto Rico or other U.S. territories (88.7%). More than 4 out of 5 women (83.9%) delivering multiple births had an adequate intensive number of visits (at least 110% of the expected number of prenatal care visits adjusted for the length of pregnancy) compared with 42.2% of women who gave birth to singletons. Women who delivered LBW infants were more likely to have adequate intensive services and also more likely to have inadequate services than women who delivered normal weight infants (2,500+ grams).

**Figure 13. Trends in Adequacy of Prenatal Care<sup>1</sup> by Race and Hispanic Ethnicity, Massachusetts: 1996-2002**



PLEASE NOTE THAT VERTICAL SCALE OF GRAPH REPRESENTS A SMALL INTERVAL FOR PURPOSES OF VISUAL REPRESENTATION.

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index.



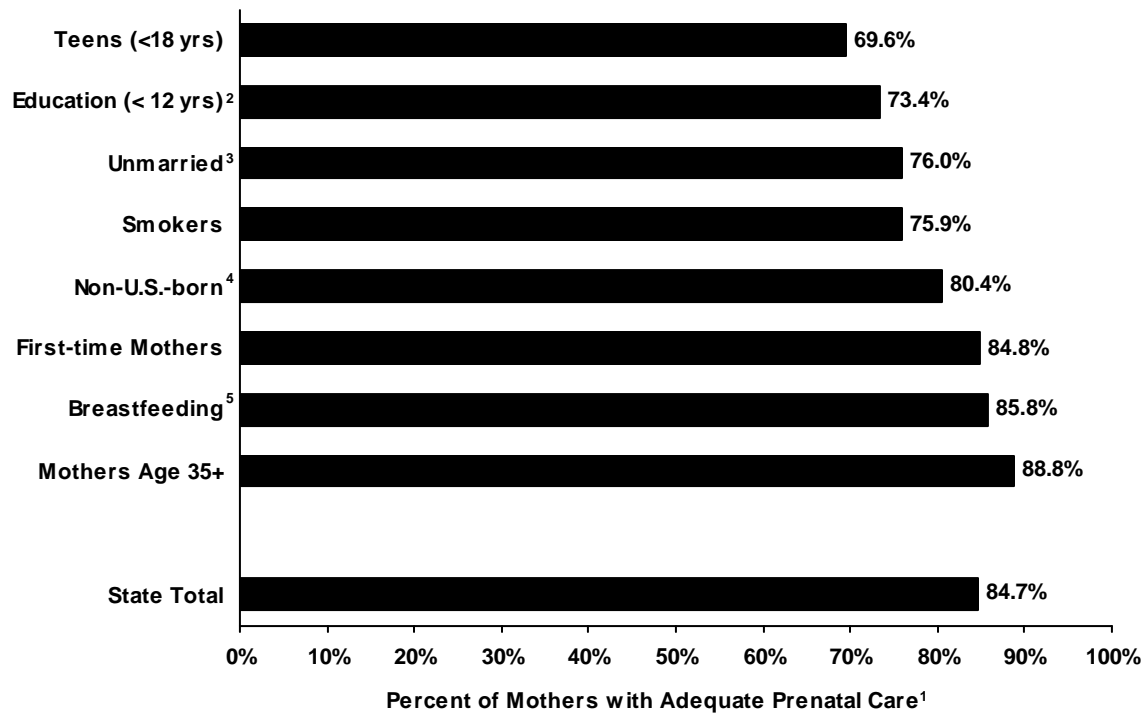
**Table 17. Adequacy of Prenatal Care Utilization<sup>1</sup>: Summary and Component Indices,  
Massachusetts: 2002**

	Adequate Total <sup>2</sup>		Adequate Intensive <sup>3</sup>		Adequate Basic <sup>3</sup>		Intermediate <sup>3</sup>		Inadequate <sup>3</sup>		Unknown <sup>3</sup>
	n	%	n	%	n	%	n	%	n	%	n
<b><u>Summary Index</u></b> <sup>4</sup>											
Adequacy of Prenatal Care Utilization	67,784	84.7	31,616	39.5	36,168	45.2	5,905	7.4	6,336	7.9	599
<b><u>Component Indices</u></b> <sup>4</sup>											
Adequacy of Initiation	74,257	92.8	33,719	42.1	40,538	50.7	3,752	4.7	2,016	2.5	599
Adequacy of Received Services (Visits)	72,675	90.8	35,373	44.2	37,302	46.6	6,453	8.1	897	1.1	599

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic categories. 3. For definitions of these categories, please see the Technical Notes in the Appendix. 4. For an explanation of the APNCU Index (summary index) and its component indices, please see the Technical Note at the beginning of this chapter.

**Figure 14. Adequacy of Prenatal Care<sup>1</sup> for Selected Population Characteristics, Massachusetts: 2002**



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 2. Women 20 years of age and older. 3. Marital status at time of birth. 4. Non-U.S.-born includes women born outside of the 50 U.S. states, District of Columbia, and U.S. territories (Puerto Rico, U.S. Virgin Islands, Guam). 5. Mother was or was intending to breastfeed at the time the birth certificate was completed.

**Table 18. Adequacy of Prenatal Care<sup>1</sup> by Selected Characteristics, Massachusetts: 2002**

	<u>Adequate Total<sup>2</sup></u>		<u>Adequate Intensive</u>		<u>Adequate Basic</u>		<u>Intermediate</u>		<u>Inadequate</u>		<u>Unknown</u>
	n	%	n	%	n	%	n	%	n	%	n
<b>State Total</b>	<b>67,784</b>	<b>84.7%</b>	<b>31,616</b>	<b>39.5%</b>	<b>36,168</b>	<b>45.2%</b>	<b>5,905</b>	<b>7.4%</b>	<b>6,336</b>	<b>7.9%</b>	<b>599</b>
<b>Age</b>	<b><u>Maternal Demographics</u></b>										
<18	1,079	69.6%	562	36.2%	517	33.3%	117	7.5%	355	22.9%	20
18-19	2,260	72.5%	1,092	35.0%	1,168	37.5%	270	8.7%	587	18.8%	27
20-24	9,171	77.9%	4,341	36.9%	4,830	41.0%	1,018	8.6%	1,590	13.5%	101
25-29	15,435	84.1%	7,178	39.1%	8,257	45.0%	1,446	7.9%	1,462	8.0%	141
30-34	23,644	87.6%	10,611	39.3%	13,033	48.3%	1,950	7.2%	1,405	5.2%	164
35-39	13,356	89.0%	6,377	42.5%	6,979	46.5%	915	6.1%	736	4.9%	114
40+	2,839	87.9%	1,455	45.1%	1,384	42.9%	189	5.9%	201	6.2%	31
<b>Educational Attainment</b>											
< than High School	5,603	71.8%	2,862	36.7%	2,741	35.1%	710	9.1%	1,487	19.1%	87
High School	16,193	80.6%	8,051	40.1%	8,142	40.5%	1,629	8.1%	2,271	11.3%	158
Some college	15,513	85.6%	7,450	41.1%	8,063	44.5%	1,358	7.5%	1,256	6.9%	114
College	18,988	89.2%	8,426	39.6%	10,562	49.6%	1,430	6.7%	872	4.1%	121
More than college	11,387	90.5%	4,775	37.9%	6,612	52.5%	773	6.1%	428	3.4%	62
<b>Race/Hispanic Ethnicity</b>											
Hispanic	7,491	79.0%	3,757	39.6%	3,734	39.4%	708	7.5%	1,284	13.5%	60
White non-Hispanic	50,347	87.1%	23,226	40.2%	27,121	46.9%	4,208	7.3%	3,234	5.6%	347
Black non-Hispanic	4,370	74.8%	2,098	35.9%	2,272	38.9%	456	7.8%	1,013	17.3%	109
Asian	4,328	81.9%	1,977	37.4%	2,351	44.5%	388	7.3%	566	10.7%	18
Other	1,191	76.3%	529	33.9%	662	42.4%	138	8.8%	231	14.8%	16
<b>Birthplace</b>											
U.S. States/D.C.	51,063	86.3%	23,657	40.0%	27,406	46.3%	4,370	7.4%	3,760	6.4%	432
Puerto Rico/U.S. Terr.	1,627	78.9%	821	39.8%	806	39.1%	175	8.5%	261	12.7%	18
Non-U.S.-Born	15,024	80.4%	7,103	38.0%	7,921	42.4%	1,353	7.2%	2,310	12.4%	138
<b>Parity<sup>3</sup></b>	<b><u>Pregnancy-Related Factors</u></b>										
1	29,443	84.8%	13,544	39.0%	15,899	45.8%	2,508	7.2%	2,761	8.0%	199
2-3	33,927	85.7%	15,862	40.1%	18,065	45.6%	2,914	7.4%	2,739	6.9%	232
4+	4,385	77.0%	2,196	38.6%	2,189	38.4%	478	8.4%	832	14.6%	49
<b>Smoking<sup>4</sup></b>											
Yes	4,814	75.9%	2,513	39.6%	2,301	36.3%	590	9.3%	936	14.8%	55
No	62,881	85.5%	29,057	39.5%	33,824	46.0%	5,309	7.2%	5,387	7.3%	484
<b>Plurality</b>	<b><u>Birth Outcomes</u></b>										
Singleton	64,116	84.2%	28,461	37.4%	35,655	46.8%	5,811	7.6%	6,198	8.1%	548
Multiple birth	3,668	94.1%	3,155	80.9%	513	13.2%	94	2.4%	138	3.5%	51
<b>Birthweight</b>											
<500 g	96	84.2%	92	80.7%	4	3.5%	7	6.1%	11	9.6%	11
500-1,499 g	845	89.3%	761	80.4%	84	8.9%	23	2.4%	78	8.2%	38
1,499-2,499 g	4,246	86.7%	3,384	69.1%	862	17.6%	188	3.8%	461	9.4%	56
2,500-3,999 g	54,956	84.3%	24,572	37.7%	30,384	46.6%	4,957	7.6%	5,246	8.1%	335
4,000+ g	7,626	85.8%	2,795	31.4%	4,831	54.3%	729	8.2%	538	6.0%	50
<b>Gestational Age</b>											
<28 weeks	422	87.4%	388	80.3%	34	7.0%	15	3.1%	46	9.5%	29
<37 weeks	5,889	88.3%	5,057	75.8%	832	12.5%	248	3.7%	535	8.0%	123
37-42 weeks	61,733	84.4%	26,489	36.2%	35,244	48.2%	5,642	7.7%	5,769	7.9%	317

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth. 4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.

**Table 19. Adequacy of Prenatal Care Initiation<sup>1</sup> by Selected Characteristics, Massachusetts: 2002**

	<u>Adequate Total</u> <sup>2</sup>		<u>Adequate Intensive</u>		<u>Adequate Basic</u>		<u>Intermediate</u>		<u>Inadequate</u>		<u>Unknown</u>
	n	%	n	%	n	%	n	%	n	%	n
State Total	74,257	92.8%	33,719	42.1%	40,538	50.7%	3,752	4.7%	2,016	2.5%	599
Age	<u>Maternal Demographics</u>										
<18	1,213	78.2%	459	29.6%	754	48.6%	211	13.6%	127	8.2%	20
18-19	2,564	82.3%	981	31.5%	1,583	50.8%	391	12.5%	162	5.2%	27
20-24	10,297	87.4%	4,352	36.9%	5,945	50.5%	980	8.3%	502	4.3%	101
25-29	17,019	92.8%	7,904	43.1%	9,115	49.7%	864	4.7%	460	2.5%	141
30-34	25,771	95.5%	12,043	44.6%	13,728	50.8%	775	2.9%	453	1.7%	164
35-39	14,348	95.6%	6,523	43.5%	7,825	52.1%	414	2.8%	245	1.6%	114
40+	3,045	94.3%	1,457	45.1%	1,588	49.2%	117	3.6%	67	2.1%	31
Educational Attainment											
< than High School	6,397	82.0%	2,526	32.4%	3,871	49.6%	901	11.6%	502	6.4%	87
High School	18,003	89.6%	7,738	38.5%	10,265	51.1%	1,388	6.9%	702	3.5%	158
Some college	16,993	93.7%	7,590	41.9%	9,403	51.9%	742	4.1%	392	2.2%	114
College	20,541	96.5%	9,407	44.2%	11,134	52.3%	487	2.3%	262	1.2%	121
More than college	12,217	97.1%	6,418	51.0%	5,799	46.1%	223	1.8%	148	1.2%	62
Race/Hispanic Ethnicity											
Hispanic	8,269	87.2%	3,838	40.5%	4,431	46.7%	812	8.6%	402	4.2%	60
White non-Hispanic	54,924	95.0%	25,176	43.6%	29,748	51.5%	1,892	3.3%	973	1.7%	347
Black non-Hispanic	4,907	84.0%	2,214	37.9%	2,693	46.1%	540	9.2%	392	6.7%	109
Asian	4,748	89.9%	1,915	36.3%	2,833	53.6%	374	7.1%	160	3.0%	18
Other	1,345	86.2%	556	35.6%	789	50.6%	129	8.3%	86	5.5%	16
Birthplace											
U.S. States/D.C.	55,825	94.3%	25,595	43.2%	30,230	51.1%	2,264	3.8%	1,104	1.9%	432
Puerto Rico/U.S. Terr.	1,818	88.1%	822	39.8%	996	48.3%	170	8.2%	75	3.6%	18
Non-U.S.-Born	16,536	88.5%	7,260	38.9%	9,276	49.6%	1,316	7.0%	835	4.5%	138
Parity <sup>3</sup>	<u>Pregnancy-Related Factors</u>										
1	32,206	92.8%	14,702	42.4%	17,504	50.4%	1,626	4.7%	880	2.5%	199
2-3	37,100	93.7%	16,930	42.8%	20,170	51.0%	1,610	4.1%	870	2.2%	232
4+	4,917	86.3%	2,067	36.3%	2,850	50.0%	515	9.0%	263	4.6%	49
Smoking <sup>4</sup>											
Yes	5,461	86.1%	2,181	34.4%	3,280	51.7%	546	8.6%	333	5.3%	55
No	68,700	93.4%	31,496	42.8%	37,204	50.6%	3,200	4.3%	1,677	2.3%	484
Plurality	<u>Birth Outcomes</u>										
Singleton	70,490	92.6%	31,838	41.8%	38,652	50.8%	3,642	4.8%	1,993	2.6%	548
Multiple birth	3,767	96.6%	1,881	48.2%	1,886	48.4%	110	2.8%	23	0.6%	51
Birthweight											
<500 g	104	91.2%	52	45.6%	52	45.6%	3	2.6%	7	6.1%	11
500-1,499 g	875	92.5%	499	52.7%	376	39.7%	46	4.9%	25	2.6%	38
1,499-2,499 g	4,462	91.2%	2,089	42.7%	2,373	48.5%	303	6.2%	130	2.7%	56
2,500-3,999 g	60,381	92.7%	27,215	41.8%	33,166	50.9%	3,089	4.7%	1,689	2.6%	335
4,000+ g	8,419	94.7%	3,857	43.4%	4,562	51.3%	310	3.5%	164	1.8%	50
Gestational Age											
<28 weeks	441	91.3%	231	47.8%	210	43.5%	25	5.2%	17	3.5%	29
<37 weeks	6,172	92.5%	3,070	46.0%	3,102	46.5%	333	5.0%	167	2.5%	123
37-42 weeks	67,907	92.8%	30,589	41.8%	37,318	51.0%	3,402	4.7%	1,835	2.5%	317

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Initiation Index, a component index of the APNCU Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth.

4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.

**Table 20. Adequacy of Prenatal Care Visits<sup>1</sup> by Selected Characteristics, Massachusetts: 2002**

	<u>Adequate Total</u> <sup>2</sup>		<u>Adequate Intensive</u>		<u>Adequate Basic</u>		<u>Intermediate</u>		<u>Inadequate</u>		<u>Unknown</u>
	n	%	n	%	n	%	n	%	n	%	n
<b>State Total</b>	<b>72,675</b>	<b>90.8%</b>	<b>35,373</b>	<b>44.2%</b>	<b>37,302</b>	<b>46.6%</b>	<b>6,453</b>	<b>8.1%</b>	<b>897</b>	<b>1.1%</b>	<b>599</b>
<b>Age</b>	<b><u>Maternal Demographics</u></b>										
<18	1,358	87.6%	780	50.3%	578	37.3%	152	9.8%	41	2.6%	20
18-19	2,730	87.6%	1,451	46.6%	1,279	41.0%	324	10.4%	63	2.0%	27
20-24	10,433	88.6%	5,282	44.8%	5,151	43.7%	1,154	9.8%	192	1.6%	101
25-29	16,548	90.2%	8,034	43.8%	8,514	46.4%	1,583	8.6%	212	1.2%	141
30-34	24,681	91.4%	11,421	42.3%	13,260	49.1%	2,077	7.7%	241	0.9%	164
35-39	13,929	92.8%	6,828	45.5%	7,101	47.3%	962	6.4%	116	0.8%	114
40+	2,996	92.8%	1,577	48.8%	1,419	43.9%	201	6.2%	32	1.0%	31
<b>Educational Attainment</b>											
< than High School	6,771	86.8%	3,738	47.9%	3,033	38.9%	862	11.1%	167	2.1%	87
High School	17,945	89.3%	9,377	46.7%	8,568	42.6%	1,829	9.1%	319	1.6%	158
Some college	16,503	91.0%	8,231	45.4%	8,272	45.6%	1,456	8.0%	168	0.9%	114
College	19,637	92.2%	8,940	42.0%	10,697	50.2%	1,493	7.0%	160	0.8%	121
More than college	11,708	93.0%	5,027	39.9%	6,681	53.1%	805	6.4%	75	0.6%	62
<b>Race/Hispanic Ethnicity</b>											
Hispanic	8,552	90.2%	4,569	48.2%	3,983	42.0%	811	8.6%	120	1.3%	60
White non-Hispanic	52,806	91.4%	25,151	43.5%	27,655	47.9%	4,463	7.7%	520	0.9%	347
Black non-Hispanic	5,113	87.6%	2,653	45.4%	2,460	42.1%	569	9.7%	157	2.7%	109
Asian	4,775	90.4%	2,312	43.8%	2,463	46.6%	444	8.4%	63	1.2%	18
Other	1,367	87.6%	657	42.1%	710	45.5%	159	10.2%	34	2.2%	16
<b>Birthplace</b>											
U.S. States/D.C.	53,899	91.1%	25,855	43.7%	28,044	47.4%	4,698	7.9%	596	1.0%	432
Puerto Rico/U.S. Terr.	1,829	88.7%	968	46.9%	861	41.7%	202	9.8%	32	1.6%	18
Non-U.S.-Born	16,873	90.3%	8,512	45.6%	8,361	44.7%	1,546	8.3%	268	1.4%	138
<b>Parity</b> <sup>3</sup>	<b><u>Pregnancy-Related Factors</u></b>										
1	31,624	91.1%	15,245	43.9%	16,379	47.2%	2,713	7.8%	375	1.1%	199
2-3	36,005	91.0%	17,437	44.1%	18,568	46.9%	3,171	8.0%	404	1.0%	232
4+	5,015	88.1%	2,677	47.0%	2,338	41.1%	564	9.9%	116	2.0%	49
<b>Smoking</b> <sup>4</sup>											
Yes	5,521	87.1%	3,042	48.0%	2,479	39.1%	680	10.7%	139	2.2%	55
No	67,058	91.1%	32,280	43.9%	34,778	47.3%	5,765	7.8%	754	1.0%	484
<b>Plurality</b>	<b><u>Birth Outcomes</u></b>										
Singleton	68,887	90.5%	32,102	42.2%	36,785	48.3%	6,354	8.3%	884	1.2%	548
Multiple birth	3,788	97.1%	3,271	83.9%	517	13.3%	99	2.5%	13	0.3%	51
<b>Birthweight</b>											
<500 g	99	86.8%	95	83.3%	4	3.5%	7	6.1%	8	7.0%	11
500-1,499 g	893	94.4%	803	84.9%	90	9.5%	25	2.6%	28	3.0%	38
1,499-2,499 g	4,601	94.0%	3,681	75.2%	920	18.8%	222	4.5%	72	1.5%	56
2,500-3,999 g	59,039	90.6%	27,676	42.5%	31,363	48.1%	5,412	8.3%	708	1.1%	335
4,000+ g	8,027	90.3%	3,105	34.9%	4,922	55.3%	786	8.8%	80	0.9%	50
<b>Gestational Age</b>											
<28 weeks	447	92.5%	410	84.9%	37	7.7%	15	3.1%	21	4.3%	29
<37 weeks	6,285	94.2%	5,402	81.0%	883	13.2%	277	4.2%	110	1.6%	123
37-42 weeks	66,210	90.5%	29,890	40.9%	36,320	49.7%	6,158	8.4%	776	1.1%	317

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Received Services (Visits) Index, a component index of the APNCU Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth. 4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.



## **CHAPTER 6**

### **PRENATAL CARE SOURCE OF PAYMENT**





## **Prenatal Care Payment Source**

In 2002, among all births to Massachusetts women, 70.5% were to mothers who had their prenatal care paid for by private sources (commercial indemnity plans, commercial managed care organizations (HMO, PPO/IPP/IPA, etc.), or other private insurance) (Figure 15). Public entitlement programs, including Commonhealth, Medicaid/MassHealth and Healthy Start (a Massachusetts-funded program), covered the prenatal care expenses for 28.5% of all births to Massachusetts women in 2002. This percentage has increased each year since 1996 (24.2%), increasing by 18% between 1996 and 2002. Finally, less than 1% of all births were to mothers who either paid for their prenatal care themselves (0.6%) or had their care paid for by other sources (0.5%).

## **Characteristics of Women Who Use Publicly Financed and Privately Insured Prenatal Care**

Maternal and birth characteristics varied according to whether prenatal care was financed through public programs or through private insurance. Differences in characteristics between those served by public programs and those covered by private insurance may reflect different levels of risk rather than the quality of care received. Among women whose prenatal care was funded by Medicaid/MassHealth, 16.6% were under the age of 20. In contrast, only 1.7% of women whose prenatal care was privately insured was under age 20 (Table 21). Hispanic women had the highest proportion of mothers under the age of 20 among both, with publicly (20.5%) and privately (6.4%) funded prenatal care.

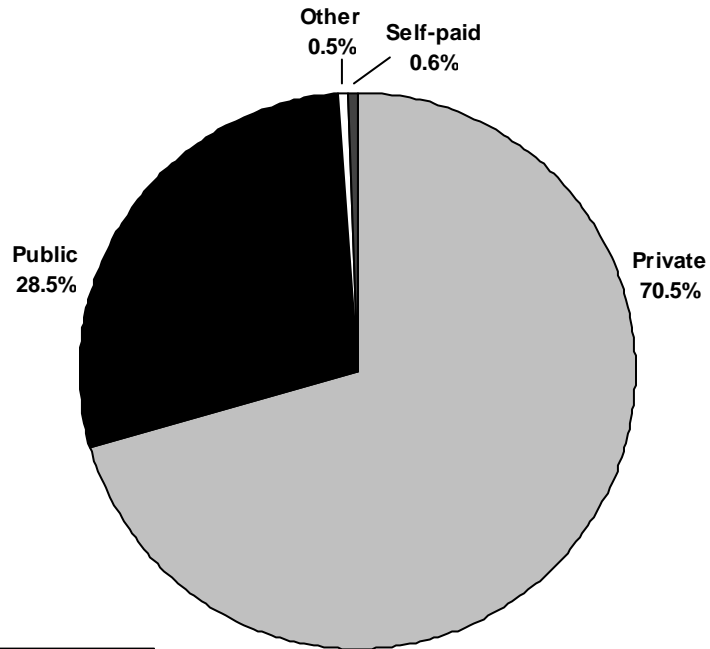
Overall, women whose prenatal care was publicly funded had a higher proportion of low birthweight (8.6%) than women whose prenatal care was privately insured (6.9%). However, this relationship between prenatal care payment source and low birthweight varied by race/ethnicity (Table 21). White non-Hispanic and Asian women with publicly financed prenatal care were more likely to have low birthweight compared to those with private insurance. However, among Hispanic and black non-Hispanic women, there was little difference in infants' low birthweight based on prenatal care insurance source. Hispanic women with private insurance were somewhat more likely to have low birthweight (8.3%) compared to those with publicly financed insurance (8.1%).

Women whose prenatal care was publicly financed were less likely to receive adequate prenatal care. This was true overall and within each race and ethnicity group. For example, 68.1% of black non-Hispanic women whose prenatal care was publicly financed received adequate prenatal care, while 86.8% of black non-Hispanic women with private insurance received adequate prenatal care (Table 21).

Overall, women with publicly funded prenatal care were less likely to deliver by Cesarean section (24.3%), compared to women with private insurance (29.7%). This was true overall and within each race and ethnicity group (Table 21). Asian women were the least likely to deliver by Cesarean section compared to all other racial and ethnicity groups. This was true among both Asian mothers with publicly funded prenatal care (17.9%) and privately insured (26.4%) prenatal care. By contrast, black non-Hispanic women were the most likely to deliver by Cesarean section among both mothers with publicly funded (27.2%) and privately insured (34.2%) prenatal care.

Women of all race and ethnicity groups whose prenatal care was publicly funded were less likely to report breastfeeding or the intent to breastfeed (67.4%) compared with women who had private insurance (79.7%). The lowest breastfeeding rates were found among white non-Hispanic (58.9%) and Asian (60.2%) women (Table 21).

**Figure 15. Distribution of Prenatal Care Payment Source<sup>1</sup>,  
Massachusetts: 2002**



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Private: Commercial indemnity plan, commercial managed care (HMO, PPO, IPP, IPA, and other), or other private insurance. Public: Government programs including Commonhealth, Healthy Start, Medicaid/MassHealth, and Medicare (may also be HMO or managed care), or free care. Other: Worker's Compensation and other sources.

**Table 21. Birth Characteristics by Source of Prenatal Care Payment, Race and Hispanic Ethnicity, Massachusetts: 2002**

Race, Ethnicity, and Payment Source	Births <sup>1</sup>		Teen Births				Birthweight			
			<18 Years		<20 Years		Very Low <sup>2</sup>		Low <sup>3</sup>	
	n	%	n	%	n	%	n	%	N	%
<b>STATE TOTAL<sup>4</sup></b>	<b>80,624</b>	<b>100.0</b>	<b>1,571</b>	<b>1.9</b>	<b>4,715</b>	<b>5.8</b>	<b>1,109</b>	<b>1.4</b>	<b>6,060</b>	<b>7.5</b>
Public	22,494	28.5	1,170	5.2	3,563	15.8	325	1.4	1,941	8.6
Medicaid <sup>5</sup>	18,562	23.5	1,026	5.5	3,087	16.6	279	1.5	1,640	8.8
Other Public <sup>6</sup>	3,932	5.0	144	3.7	476	12.1	46	1.2	301	7.7
Private <sup>7</sup>	55,678	70.5	346	0.6	974	1.7	692	1.2	3,827	6.9
<b>White non-Hispanic</b>	<b>58,136</b>	<b>100.0</b>	<b>598</b>	<b>1.0</b>	<b>2,167</b>	<b>3.7</b>	<b>666</b>	<b>1.1</b>	<b>3,952</b>	<b>6.8</b>
Public	10,268	18.1	376	3.7	1,465	14.3	105	1.0	772	7.5
Medicaid <sup>5</sup>	8,778	15.5	342	3.9	1,316	15.0	95	1.1	680	7.7
Other Public <sup>6</sup>	1,490	2.6	34	2.3	149	10.0	10	0.7	92	6.2
Private <sup>7</sup>	45,982	80.9	199	0.4	617	1.3	507	1.1	2,973	6.5
<b>Black non-Hispanic</b>	<b>5,948</b>	<b>100.0</b>	<b>229</b>	<b>3.9</b>	<b>630</b>	<b>10.6</b>	<b>182</b>	<b>3.1</b>	<b>747</b>	<b>12.6</b>
Public	3,460	59.2	165	4.8	481	13.9	82	2.4	429	12.4
Medicaid <sup>5</sup>	2,858	48.9	149	5.2	421	14.7	70	2.4	356	12.5
Other Public <sup>6</sup>	602	10.3	16	2.7	60	10.0	12	2.0	73	12.1
Private <sup>7</sup>	2,333	39.9	53	2.3	118	5.1	78	3.3	281	12.0
<b>Hispanic</b>	<b>9,543</b>	<b>100.0</b>	<b>607</b>	<b>6.4</b>	<b>1,557</b>	<b>16.3</b>	<b>162</b>	<b>1.7</b>	<b>792</b>	<b>8.3</b>
Public	6,524	68.7	521	8.0	1,335	20.5	102	1.6	531	8.1
Medicaid <sup>5</sup>	4,996	52.6	433	8.7	1,087	21.8	80	1.6	416	8.3
Other Public <sup>6</sup>	1,528	16.1	88	5.8	248	16.2	22	1.4	115	7.5
Private <sup>7</sup>	2,814	29.6	72	2.6	181	6.4	47	1.7	233	8.3
<b>Asian</b>	<b>5,300</b>	<b>100.0</b>	<b>80</b>	<b>1.5</b>	<b>206</b>	<b>3.9</b>	<b>76</b>	<b>1.4</b>	<b>424</b>	<b>8.0</b>
Public	1,370	26.0	65	4.7	162	11.8	22	1.6	128	9.3
Medicaid <sup>5</sup>	1,192	22.6	62	5.2	155	13.0	21	1.8	116	9.7
Other Public <sup>6</sup>	178	3.4	3	-- <sup>8</sup>	7	3.9	1	-- <sup>8</sup>	12	6.7
Private <sup>7</sup>	3,850	73.1	13	0.3	37	1.0	53	1.4	288	7.5
<b>Other<sup>9</sup></b>	<b>1,576</b>	<b>100.0</b>	<b>56</b>	<b>3.6</b>	<b>151</b>	<b>9.6</b>	<b>22</b>	<b>1.4</b>	<b>137</b>	<b>8.7</b>
Public	863	56.0	43	5.0	120	13.9	14	1.6	80	9.3
Medicaid <sup>5</sup>	730	47.3	40	5.5	108	14.8	13	1.8	71	9.7
Other Public <sup>6</sup>	133	8.6	3	-- <sup>8</sup>	12	9.0	1	-- <sup>8</sup>	9	6.8
Private <sup>7</sup>	652	42.3	9	1.4	21	3.2	7	1.1	49	7.5

**Table 21 (cont'd). Birth Characteristics by Source of Prenatal Care Payment, Race, and Hispanic Ethnicity, Massachusetts: 2002**

Race, Ethnicity, and Payment Source	Prenatal Care							
	Adequate <sup>10</sup>		Began 1st Trimester		Cesarean Section		Breastfeeding <sup>11</sup>	
	n	%	n	%	n	%	n	%
<b>STATE TOTAL<sup>4</sup></b>	<b>67,784</b>	<b>84.7</b>	<b>67,457</b>	<b>84.2</b>	<b>22,553</b>	<b>28.1</b>	<b>60,266</b>	<b>76.1</b>
Public	16,711	74.9	15,861	70.9	5,458	24.3	15,135	67.4
Medicaid <sup>5</sup>	14,013	76.1	13,294	71.9	4,456	24.1	12,092	65.2
Other Public <sup>6</sup>	2,698	69.4	2,567	65.7	1,002	25.6	3,043	77.7
Private <sup>7</sup>	49,414	89.0	49,912	89.9	16,484	29.7	44,325	79.7
<b>White non-Hispanic</b>	<b>50,347</b>	<b>87.1</b>	<b>50,763</b>	<b>87.8</b>	<b>16,737</b>	<b>28.9</b>	<b>42,458</b>	<b>74.7</b>
Public	7,903	77.4	7,571	74.0	2,542	24.8	6,040	58.9
Medicaid <sup>5</sup>	6,796	77.8	6,510	74.4	2,117	24.2	4,917	56.1
Other Public <sup>6</sup>	1,107	74.6	1,061	71.4	425	28.6	1,123	75.7
Private <sup>7</sup>	41,042	89.5	41,763	91.0	13,690	29.8	35,913	78.2
<b>Black non-Hispanic</b>	<b>4,370</b>	<b>74.8</b>	<b>4,199</b>	<b>71.4</b>	<b>1,769</b>	<b>29.9</b>	<b>4,540</b>	<b>77.0</b>
Public	2,304	68.1	2,205	64.5	940	27.2	2,503	72.4
Medicaid <sup>5</sup>	1,988	71.0	1,896	67.1	755	26.5	2,065	72.3
Other Public <sup>6</sup>	316	54.2	309	52.4	185	30.8	438	72.9
Private <sup>7</sup>	2,012	86.8	1,939	83.5	794	34.2	1,969	84.5
<b>Hispanic</b>	<b>7,491</b>	<b>79.0</b>	<b>7,155</b>	<b>75.3</b>	<b>2,325</b>	<b>24.5</b>	<b>7,702</b>	<b>81.0</b>
Public	4,925	75.9	4,671	71.9	1,495	23.0	5,083	78.1
Medicaid <sup>5</sup>	3,842	77.3	3,654	73.4	1,178	23.7	3,847	77.1
Other Public <sup>6</sup>	1,083	71.4	1,017	66.7	317	20.8	1,236	81.2
Private <sup>7</sup>	2,447	87.1	2,366	84.1	794	28.2	2,471	87.8
<b>Asian</b>	<b>4,328</b>	<b>81.9</b>	<b>4,138</b>	<b>78.3</b>	<b>1,275</b>	<b>24.1</b>	<b>4,248</b>	<b>80.5</b>
Public	965	70.9	837	61.2	245	17.9	823	60.2
Medicaid <sup>5</sup>	851	71.8	735	61.8	206	17.3	689	57.9
Other Public <sup>6</sup>	114	64.8	102	57.6	39	22.0	134	75.7
Private <sup>7</sup>	3,317	86.3	3,258	84.8	1,014	26.4	3,375	87.7
<b>Other<sup>9</sup></b>	<b>1,191</b>	<b>76.3</b>	<b>1,143</b>	<b>73.0</b>	<b>421</b>	<b>26.8</b>	<b>1,275</b>	<b>81.9</b>
Public	606	70.8	570	66.4	231	26.8	680	78.8
Medicaid <sup>5</sup>	529	72.7	493	67.5	196	26.9	568	77.8
Other Public <sup>6</sup>	77	60.2	77	59.7	35	26.5	112	84.2
Private <sup>7</sup>	555	85.5	542	83.5	176	27.0	563	86.5

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the "Births" category, percentages are based on race/ethnicity totals (group column). For all other categories, percentages are based on Birth totals (row total) excluding unknowns for each characteristic. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low Birthweight: less than 2,500 grams or 5.5 pounds. 4. Total births does not equal Public + Private. Other categories of prenatal care payment are also included in Total: Workers' Compensation, self-paid, and other. 5. Medicaid/MassHealth. 6. Other Public: Commonwealth, Healthy Start, Medicare, other government programs, and free care. 7. Private: commercial indemnity plans or commercial managed care org. (HMO, PPO, IPP, or IPA). 8. Calculations based on fewer than five events are excluded. 9. Other: Mothers who designated their race as American Indian or Other. 10. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 11. Mother was intending to breastfeed at the time the birth certificate was completed.



## **CHAPTER 7**

# **CESAREAN SECTION DELIVERIES BY HOSPITAL**





In 2002, 81,699 births occurred in Massachusetts, a decrease of 14% since 1990 (Table 24). *(Please note: the percentages and rates provided in Tables 22, 23, 24, and 25 are based on occurrence births and differ from data presented elsewhere in this report, which are based on resident births. See Glossary for definitions of occurrence and resident births.)*

### **Cesarean Section<sup>1</sup> Delivery by Facility<sup>2</sup>**

Cesarean section was the method of delivery for 28.2% of the live births occurring in Massachusetts (“occurrence births”) in 2002 (Table 22), up 10% from the 2001 rate of 25.6% (data not shown). Since 1997, there has been a 42% increase in the percentage of Cesarean section deliveries in Massachusetts, from 19.8% in 1997 to 28.2% in 2002, after a steady decline in Cesarean sections from 1990 (22.5%) to 1997 (19.8%) (data not shown). Calculations are based on births with known method of delivery. Note: facility-specific highlights in this chapter focus on facilities with at least 40 births in the category of interest. Data for all facilities are provided in Tables 22 and 23.

In 2002, the following facilities had Cesarean section delivery rates at least 15% below or at least 15% above the state rate of 28.2% (Table 22):

- Eight facilities had rates below 24.0% (0.85 times the state rate): Berkshire Hospital, Mercy Medical Center, Tobey Hospital, Heywood Hospital, Cooley Dickinson Hospital, Holyoke Hospital, St. Luke's Hospital, and Charlton Memorial Hospital.
- Seven facilities had rates above 32.4% (1.15 times the state rate): Melrose-Wakefield Hospital, New England Medical Center Hospital, Newton Wellesley Hospital, Beth Israel Deaconess Medical Center, St. Elizabeth's Medical Center, Holy Family Hospital and Medical Center, and Martha's Vineyard Hospital.

### **Primary Cesarean Section Deliveries**

The primary Cesarean section delivery rate is defined as the proportion of live births delivered by Cesarean section to mothers with no previous history of a Cesarean section. This rate was 20.5% statewide in 2002, up 9% from the 2001 rate of 18.8% (data not shown).

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<sup>1</sup> Percentages of delivery by method in Table 22 are calculated in following manner:

- Percentage of total Cesarean sections = (Total Cesarean Births / All Births) x 100.
- Percentage primary Cesarean sections = (Primary Cesarean Sections / (All Births - Repeat Cesarean Sections - VBACs)) x 100.
- Percentage repeat Cesarean sections = (Repeat Cesarean Sections / (Repeat Cesarean Sections + VBACs)) x 100.
- Percentage of vaginal birth after Cesarean section delivery, that is, VBACs = (VBAC deliveries / (Repeat Cesarean Sections + VBAC)) x 100. Please note: the sum of the percentages of repeat Cesarean section deliveries + VBACs = 100% of all deliveries of mothers with a prior Cesarean section.

<sup>2</sup> Facilities included in this chapter are medical units licensed by the Commonwealth for the care of women during pregnancy and childbirth. Listed also as licensed maternity facilities in Tables 22 and 23.

In 2002, the following facilities had primary Cesarean section delivery rates 15% below and above the state rate of 20.5% (Table 22):

- Eight facilities had this rate below 17.0% (0.85 times the state rate): Tobey Hospital, Berkshire Medical Center, Mercy Medical Center, Heywood Hospital, Cooley Dickinson Hospital, St. Luke's Hospital, Leominster Hospital, and Cape Cod Hospital, ranging from 12.3% for Tobey Hospital to 16.9% for Cape Cod Hospital.
- Five facilities had this rate above 24.0% (1.15 times the state rate): Cambridge Hospital, New England Medical Center Hospital, Beth Israel Deaconess Medical Center, St. Elizabeth's Medical Center, and Holy Family Hospital and Medical Center.

### **Repeat Cesarean Section Deliveries**

The proportion of live births delivered by Cesarean section to mothers with a prior Cesarean section is known as the repeat Cesarean section delivery rate. This rate was 85.3% in 2002, up 6% from the 2001 rate of 80.8% (data not shown).

Repeat Cesarean section delivery rates were lowest at Saint Vincent Hospital (71.3%) and Cooley Dickinson Hospital (72.5%). Facilities with high rates of repeat Cesarean section deliveries include Winchester Hospital (97.5%), Metrowest Medical Center-Framingham Union Campus (99.6%) and Massachusetts General Hospital (100%) (Table 22).

### **Vaginal Birth after Cesarean Section (VBAC) Deliveries**

The proportion of live births delivered vaginally to mothers with a prior Cesarean section is known as the vaginal birth after a Cesarean section (VBAC) delivery rate. In 2002, the VBAC rate was 14.7%, down 23% from the 2001 rate of 19.2% (data not shown). In 1996, the VBAC rate peaked, at 34.0% (trend data not shown), and it has been declining thereafter.

In 2002, only seven facilities had over 40 births delivered through VBAC. The VBAC delivery rate among these facilities ranged from 13.2% for UMass Memorial Medical Center-West Campus to 28.7% for Saint Vincent Hospital. The other five facilities with over 40 births delivered through VBAC were South Shore Hospital (14.7%), Beth Israel Deaconess Medical Center (16.0%), Beverly Hospital (21.0%), Brigham and Women's Hospital (23.0%), and Baystate Medical Center (24.2%).

Since the sum of the percentage of repeat Cesarean section deliveries and vaginal births after Cesareans (VBACs) equals 100% of all births to mothers with a prior Cesarean section, facilities with the lowest repeat Cesarean section delivery rates had the highest VBAC rates. In 2002, none of the maternity facilities had a VBAC rate over 30%, whereas, in the past there were some facilities with VBAC rates over 40% (one in 2001, two in 2000, four in 1999, and 13 in 1998).

### **Cesarean Section Deliveries for Singleton Births**

Cesarean section was the method of delivery for 28.1% of singleton births to mothers who gave birth to their first child in a Massachusetts licensed maternity facility in 2002 (Table 23), up 9% from the 2001 rate of 25.8% (data not shown).

In 2002, the following facilities had cesarean section delivery rates for singleton births to mothers who gave birth to their first child 15% below and above the state rate of 28.1% (Table 22):

- Nine facilities had this rate below 23.9% (0.85 times the state rate): Berkshire Medical Center, Mercy Medical Center, Cooley Dickinson Hospital, St. Luke's Hospital, Lawrence General Hospital, Cape Cod Hospital, Leominster Hospital, Holyoke Hospital, and UMass Memorial Medical Center-West Campus.
- Ten facilities had this rate above 32.3% (1.15 times the state rate): Beth Israel Deaconess Medical Center, St. Elizabeth's Medical Center, Caritas Good Samaritan Medical Center, Metrowest Medical Center-Framingham Union Campus, Milford-Whitinsville Regional Hospital, Falmouth Hospital, Emerson Hospital, Newton Wellesley Hospital, Harrington Memorial Hospital, and Holy Family Hospital and Medical Center.

In 2002, cesarean section was the method of delivery for 8.7% of singleton births to mothers having their second or later birth who had no prior cesarean section, up 7% from the 2001 rate of 8.1% (data not shown). The following facilities had this rate 15% below and above the state rate of 8.7%:

- Four facilities had this rate below 7.4%: South Shore Hospital, Mount Auburn Hospital, Beverly Hospital, and St. Luke Hospital.
- Six facilities had this rate above 10.0%: Holy Family Hospital and Medical Center, Melrose-Wakefield Hospital, St. Elizabeth's Medical Center, UMass Memorial Medical Center-West Campus, New England Medical Center Hospital, and Boston Medical Center.

In 2002, Cesarean section was the method of delivery for 84.8% of singleton births to mothers having their second or later birth who had prior Cesarean sections, up 6% from the 2001 rate of 80.2% (data not shown). Saint Vincent Hospital (71.5%) and Cooley Dickinson Hospital had the lowest rates (72.5%). Winchester Hospital (97.4%), Metrowest Medical Center-Framingham Union Campus (99.6%), and Massachusetts General Hospital (100%) had the highest rates (Table 23).

**Table 22. Cesarean Section Deliveries and Vaginal Births after Cesarean Section (VBACs) by Licensed Maternity Facility<sup>1</sup>, All Births, Massachusetts: 2002**

Facility	Occurrence Births <sup>2</sup>	Total C-Sections		Primary C-Section <sup>2</sup>		Repeat C-Section <sup>2</sup>		VBACs <sup>2</sup>	
		n	% <sup>3,4</sup>	n	% <sup>3,5</sup>	n	% <sup>3,6</sup>	n	% <sup>7</sup>
<b>STATE TOTAL</b>	<b>81,699</b>	<b>22,947</b>	<b>28.2</b>	<b>14,732</b>	<b>20.5</b>	<b>8,215</b>	<b>85.3</b>	<b>1,419</b>	<b>14.7</b>
Anna Jaques Hospital	935	225	24.1	138	16.7	87	79.1	23	20.9
Baystate Medical Center	4,380	1,181	27.6	777	20.7	404	75.8	129	24.2
Berkshire Medical Center	774	138	17.8	91	12.8	47	73.4	17	26.6
Beth Israel Deaconess Medical Center	4,947	1,690	34.2	1,127	26.4	563	84.0	107	16.0
Beverly Hospital	2,323	606	26.1	377	18.5	229	79.0	61	21.0
Boston Medical Center	2,006	552	27.5	373	20.7	179	88.2	24	11.8
Brigham and Women's Hospital	9,859	2,727	27.8	1,828	21.1	899	77.0	268	23.0
Brockton Hospital	1,135	309	27.2	183	18.5	126	85.1	22	14.9
Cambridge Hospital	923	293	31.7	197	24.2	96	87.3	14	12.7
Cape Cod Hospital	1,019	263	25.8	148	16.9	115	80.4	28	19.6
Caritas Good Samaritan Medical Center	1,083	341	31.5	219	23.2	122	89.1	15	10.9
Caritas Norwood Hospital	641	188	29.3	116	20.7	72	88.9	9	11.1
Charlton Memorial Hospital	1,651	395	23.9	278	18.4	117	81.3	27	18.8
Cooley Dickinson Hospital	872	185	21.2	119	15.3	66	72.5	25	27.5
Emerson Hospital	1,295	415	32.0	256	22.8	159	91.9	14	8.1
Fairview Hospital	163	46	28.2	27	18.8	19	100.0	0	0.0
Falmouth Hospital	635	195	30.7	132	23.6	63	84.0	12	16.0
Franklin Medical Center	451	111	24.6	73	18.2	38	76.0	12	24.0
Harrington Memorial Hospital	481	129	27.4	88	20.8	41	85.4	7	14.6
Heywood Hospital	583	122	20.9	81	15.3	41	74.5	14	25.5
Holy Family Hospital and Medical Center	1,458	519	35.6	362	28.2	157	90.2	17	9.8
Holyoke Hospital	559	125	22.4	87	17.0	38	79.2	10	20.8
Jordan Hospital	765	205	26.8	129	19.3	76	79.2	20	20.8
Lawrence General Hospital	1,581	453	28.7	227	17.0	226	92.2	19	7.8
Leominster Hospital	1,271	316	25.4	174	16.0	142	92.2	12	7.8
Lowell General Hospital	2,083	537	25.8	326	17.7	211	87.2	31	12.8
Martha's Vineyard Hospital	154	57	37.0	35	26.5	22	100.0	0	0.0
Mary Lane Hospital	164	47	28.7	24	17.6	23	82.1	5	17.9

**Table 22 (cont'd). Cesarean Section Deliveries and Vaginal Births After Cesarean Section (VBACs) by Licensed Maternity Facility<sup>1</sup>, All Births, Massachusetts: 2001**

Facility	Occurrence Births <sup>2</sup>	Total C-Sections		Primary C-Section <sup>2</sup>		Repeat C-Section <sup>2</sup>		VBACs <sup>2</sup>	
		n	% <sup>3,4</sup>	n	% <sup>3,5</sup>	n	% <sup>3,6</sup>	n	% <sup>7</sup>
Massachusetts General Hospital	3,406	956	28.1	658	21.2	298	100.0	0	0.0
Melrose-Wakefield Hospital	1,793	584	32.6	344	22.5	240	91.6	22	8.4
Mercy Medical Center	1,310	262	20.0	170	14.2	92	83.6	18	16.4
Metrowest Medical Center-Framingham Union Campus	2,263	729	32.2	455	22.9	274	99.6	1	-- <sup>9</sup>
Milford-Whitinsville Regional Hospital	980	292	29.8	208	23.6	84	86.6	13	13.4
Morton Hospital	626	180	28.9	110	20.4	70	84.3	13	15.7
Mount Auburn Hospital	1,699	441	26.0	293	19.4	148	80.0	37	20.0
Nantucket Cottage Hospital	85	17	20.0	10	13.0	7	87.5	1	-- <sup>9</sup>
New England Medical Center Hospital	1,575	514	32.6	370	26.2	144	88.3	19	11.7
Newton Wellesley Hospital	3,211	1,061	33.1	653	23.5	408	93.6	28	6.4
North Adams Regional Hospital	276	67	24.3	36	14.8	31	93.9	2	-- <sup>9</sup>
North Shore Medical Center - Salem Hospital	1,735	488	28.1	302	19.8	186	87.3	27	12.7
Saint Vincent Hospital	1,743	415	24.1	281	18.3	134	71.3	54	28.7
Saints Memorial Medical Ctr.	704	210	29.8	129	20.8	81	96.4	3	-- <sup>9</sup>
South Shore Hospital	4,073	1,185	29.1	699	20.0	486	85.3	84	14.7
St. Elizabeth's Medical Center	1,510	534	35.4	348	26.8	186	88.2	25	11.8
St. Luke's Hospital	1,509	357	23.8	199	15.3	158	81.9	35	18.1
Sturdy Memorial Hospital	1,128	325	28.8	187	19.1	138	93.2	10	6.8
Tobey Hospital	502	104	20.8	54	12.3	50	80.6	12	19.4
UMass Memorial Medical Center-West Campus	4,383	1,156	26.4	808	20.3	348	86.8	53	13.2
Winchester Hospital	2,427	696	28.7	423	19.8	273	97.5	7	2.5

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001.

1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. See Glossary for definitions of occurrence births, primary and repeat Cesarean sections, and VBACs. The percentages provided in this table are based on occurrence births, and may differ from data, which are based on resident births, presented elsewhere in this book. 3. The percentage of Cesarean births reported is not adjusted for risk factors such as mother's age, birthweight, or complications of labor and delivery, which would influence the number of procedures in a particular facility. Caution should be used when comparing unadjusted percentages. 4. Percentage of total Cesarean sections= (total Cesarean births/all births) x 100. 5. Percentage primary Cesarean sections=(primary Cesarean sections/all births-repeat Cesarean sections-VBACs) x 100. 6. Percentage repeat Cesarean sections= (repeat Cesarean sections/(repeat Cesarean sections + VBACs)) x100. 7. Percentage VBACs= (VBAC deliveries/(repeat Cesarean sections + VBAC)) x 100. 8. This percentage is based on less than 40 total births (in denominator) and should be interpreted with caution. 9. Calculations based on fewer than five events are excluded.

**Table 23. Cesarean Section Deliveries for Singleton Births by Licensed Maternity Facility<sup>1</sup> and Number of Previous Births, Massachusetts: 2002**

Facility	First Birth			Second or Later Birth without prior C-section			Second or Later Birth with prior C-section		
	Births <sup>2</sup>	C-section n	% <sup>3</sup>	Births <sup>2</sup>	C-section n	% <sup>3</sup>	Births <sup>2</sup>	C-section n	% <sup>3</sup>
<b>STATE TOTAL</b>	<b>34,196</b>	<b>9,599</b>	<b>28.1</b>	<b>34,089</b>	<b>2,979</b>	<b>8.7</b>	<b>9,060</b>	<b>7,681</b>	<b>84.8</b>
Anna Jaques Hospital	390	104	26.7	405	22	5.4	107	84	78.5
Baystate Medical Center	1,638	446	27.2	1,859	174	9.4	494	370	74.9
Berkshire Medical Center	319	60	18.8	369	26	7.0	63	46	73.0
Beth Israel Deaconess Medical Center	2,075	675	32.5	1,814	180	9.9	604	504	83.4
Beverly Hospital	957	265	27.7	1,009	69	6.8	281	220	78.3
Boston Medical Center	875	232	26.5	870	116	13.3	195	171	87.7
Brigham and Women's Hospital	4,335	1,099	25.4	3,595	290	8.1	1,028	780	75.9
Brockton Hospital	479	133	27.8	484	41	8.5	138	116	84.1
Cambridge Hospital	503	157	31.2	299	33	11.0	108	94	87.0
Cape Cod Hospital	414	95	22.9	441	35	7.9	137	109	79.6
Caritas Good Samaritan Medical Center	427	143	33.5	475	44	9.3	135	120	88.9
Caritas Norwood Hospital	261	84	32.2	279	21	7.5	81	72	88.9
Charlton Memorial Hospital	692	175	25.3	767	63	8.2	144	117	81.3
Cooley Dickinson Hospital	386	84	21.8	369	19	5.1	91	66	72.5
Emerson Hospital	494	176	35.6	590	54	9.2	167	153	91.6
Fairview Hospital	92	22	23.9	52	5	9.6	19	19	100.0 <sup>4</sup>
Falmouth Hospital	264	93	35.2	276	29	10.5	73	61	83.6
Franklin Medical Center	195	55	28.2	192	12	6.3	48	36	75.0 <sup>4</sup>
Harrington Memorial Hospital	184	72	39.1	239	16	6.7	48	41	85.4
Heywood Hospital	236	64	27.1	280	13	4.6	55	41	74.5
Holy Family Hospital and Medical Center	628	260	41.4	610	64	10.5	169	152	89.9
Holyoke Hospital	249	58	23.3	255	27	10.6	47	37	78.7 <sup>4</sup>
Jordan Hospital	306	89	29.1	344	30	8.7	94	75	79.8
Lawrence General Hospital	597	135	22.6	705	70	9.9	241	222	92.1
Leominster Hospital	443	102	23.0	606	45	7.4	148	138	93.2
Lowell General Hospital	804	197	24.5	981	85	8.7	233	202	86.7
Martha's Vineyard Hospital	74	26	35.1	56	7	12.5	22	22	100.0 <sup>4</sup>
Mary Lane Hospital	60	14	23.3	76	10	13.2	28	23	82.1 <sup>4</sup>

**Table 23 (cont'd). Cesarean Section Deliveries for Singleton Births by Licensed Maternity Facility and Number of Previous Births, Massachusetts: 2002**

Facility	<u>First Birth</u>			<u>Second or Later Birth without prior C-section</u>			<u>Second or Later Birth with prior C-section</u>		
	Births <sup>2</sup>	C-section n	% <sup>3</sup>	Births <sup>2</sup>	C-section n	% <sup>3</sup>	Births <sup>2</sup>	C-section n	% <sup>3</sup>
Massachusetts General Hospital	1,612	443	27.5	1,325	131	9.9	246	246	100.0
Melrose-Wakefield Hospital	728	230	31.6	747	83	11.1	248	226	91.1
Mercy Medical Center	494	103	20.9	694	55	7.9	108	90	83.3
Metrowest Medical Center- Framingham Union Campus	1,018	343	33.7	896	70	7.8	264	263	99.6
Milford-Whitinsville Regional Hospital	427	147	34.4	421	38	9.0	97	84	86.6
Morton Hospital	280	81	28.9	253	25	9.9	83	70	84.3
Mount Auburn Hospital	796	231	29.0	686	46	6.7	183	146	79.8
Nantucket Cottage Hospital	33	5	15.2	44	5	11.4	8	7	87.5 <sup>4</sup>
New England Medical Center Hospital	632	186	29.4	585	74	12.6	149	130	87.2
Newton Wellesley Hospital	1,285	465	36.2	1,359	113	8.3	409	381	93.2
North Adams Regional Hospital	128	31	24.2	111	4	-- <sup>5</sup>	33	31	93.9 <sup>4</sup>
North Shore Medical Center - Salem Hospital	740	210	28.4	713	53	7.4	202	175	86.6
Saint Vincent Hospital	697	181	26.0	771	61	7.9	179	128	71.5
Saints Memorial Medical Ctr.	337	90	26.7	268	27	10.1	83	80	96.4
South Shore Hospital	1,630	470	28.8	1,698	107	6.3	548	464	84.7
St. Elizabeth's Medical Center	653	212	32.5	550	68	12.4	196	171	87.2
St. Luke's Hospital	605	134	22.1	671	48	7.2	185	150	81.1
Sturdy Memorial Hospital	437	138	31.6	519	38	7.3	140	130	92.9
Tobey Hospital	198	35	17.7	230	13	5.7	56	44	78.6
UMass Memorial Medical Center-West Campus	1,917	456	23.8	1,849	232	12.5	367	316	86.1
Winchester Hospital	1,003	293	29.2	1,055	85	8.1	265	258	97.4

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001.

1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. Occurrence births (See Glossary for definition.) 3. The percentage of Cesarean births reported is not adjusted for risk factors such as mother's age, birthweight, or complications of labor and delivery, which would influence the number of procedures in a particular facility. Caution should be used when comparing unadjusted percentages. 4. This percentage is based on less than 40 total births (in denominator) and should be interpreted with caution. 5. Calculations based on fewer than five events are excluded.





## **CHAPTER 8**

### **BIRTHS BY HOSPITAL AND COMMUNITY**



### **Low Birthweight Variation by Facility**

In 2002, at least 10% of the births at seven hospitals were low birthweight. These hospitals were: New England Medical Center (25.8%), St. Elizabeth's Medical Center (13.4%), Baystate Medical Center (12.7%), Beth Israel Deaconess Medical Center (11.5%), Boston Medical Center (10.9%), Brigham and Women's Hospital (10.9%), and UMass Memorial Medical Center West Campus (10.5%) (Table 24).

### **Publicly Funded Delivery Variation by Facility**

In seven hospitals, 50% or more of the deliveries were paid with public funds: Boston Medical Center (87.8%), Holyoke Hospital (64.9%), Cambridge Hospital (61.3%), Brockton Hospital (57.7%), Mercy Medical Center (56.5%), Lawrence General Hospital (55.4%), and St. Luke Hospital (52.2%) (Table 24). In four facilities, less than 10% of deliveries were paid with public funds: The Birthplace at Wellesley (0.0%), Newton Wellesley Hospital (1.9%), Emerson Hospital (3.9%), and Winchester Hospital (5.3%).

### **Prenatal Care Adequacy Variation by Facility**

The facilities with the lowest reported rate of adequacy of prenatal care among mothers delivering in 2002 (i.e. less than 65%) were Tobey Hospital (45.9%), Boston Medical Center (52.3%), and Berkshire Medical Center (54.1%) (Table 24). Brigham and Women's Hospital, Beverly Hospital, and Metrowest Medical Center-Framingham Union Campus reported the highest rate of adequacy of prenatal care among their delivery mothers, all with over 94%.

### **Low Birthweight in the 30 Largest Massachusetts Cities and Towns**

In 2002, among the 30 largest cities and towns in the Commonwealth, low birthweight rates were highest in Springfield (10.8%), Framingham (9.8%), Brockton (9.7%), Pittsfield (9.7%), Boston (9.5%), Brookline (9.3%), and Fall River (9.1%). These communities had low birthweight rates 20% higher than the statewide rate of 7.5% (numbers are shown in Table 25A) (rates are shown on Table 3A).

**Table 24. Birth Characteristics by Licensed Maternity Facility<sup>1</sup>, Massachusetts: 2002**

Facility	Location	Occurrence Births <sup>2</sup> (n)	Low Birthweight <sup>3</sup> (%)	Public Payment for Delivery <sup>4</sup> (%)	Adequate Prenatal Care <sup>5</sup> (%)
<b>STATE TOTAL<sup>6</sup></b>		<b>81,699</b>	<b>7.5</b>	<b>27.8</b>	<b>84.7</b>
Anna Jaques Hospital	Newburyport	935	4.1	18.4	91.5
Baystate Medical Center	Springfield	4,380	12.7	40.4	80.7
Berkshire Medical Center	Pittsfield	774	5.9	38.4	54.1
Beth Israel Deaconess Medical Center	Boston	4,947	11.5	16.6	93.3
Beverly Hospital	Beverly	2,323	5.5	28.1	93.7
Boston Medical Center	Boston	2,006	10.9	87.8	52.3
Brigham And Women's Hospital	Boston	9,859	10.9	19.3	95.3
Brockton Hospital	Brockton	1,135	7.4	57.7	79.3
Cambridge Birth Center	Cambridge	89	-- <sup>7</sup>	33.7	77.5
Cambridge Hospital	Cambridge	923	3.0	61.3	72.9
Cape Cod Hospital	Barnstable	1,019	4.1	39.6	89.9
Caritas Good Samaritan Medical Center	Brockton	1,083	6.6	41.4	70.0
Caritas Norwood Hospital	Norwood	641	3.7	15.2	93.3
Charlton Memorial Hospital	Fall River	1,651	7.1	45.2	87.9
Cooley Dickinson Hospital	Northampton	872	2.9	24.9	92.0
Emerson Hospital	Concord	1,295	3.6	3.9	80.2
Fairview Hospital	Great Barrington	163	-- <sup>7</sup>	42.9	81.0
Falmouth Hospital	Falmouth	635	4.4	30.9	85.2
Franklin Medical Center	Greenfield	451	4.7	41.6	84.3
Harrington Memorial Hospital	Southbridge	481	3.2	41.7	86.6
Heywood Memorial Hospital	Gardner	583	2.6	37.0	75.8
Holy Family Hospital And Medical Center	Methuen	1,458	4.7	19.9	86.7
Holyoke Hospital	Holyoke	559	4.3	64.9	80.0
Jordan Hospital	Plymouth	765	5.5	20.4	71.5
Lawrence General Hospital	Lawrence	1,581	6.3	55.4	90.9
Leominster Hospital	Leominster	1,271	3.1	40.7	85.7
Lowell General Hospital	Lowell	2,083	5.9	36.7	66.2
Martha's Vineyard Hospital	Oak Bluffs	154	-- <sup>7</sup>	33.8	83.0

**Table 24. (cont'd) Births Characteristics by Licensed Maternity Facility<sup>1</sup>, Massachusetts: 2002**

Facility	Location	Occurrence Births <sup>2</sup> (n)	Low Birthweight <sup>3</sup> (%)	Public Payment for Delivery <sup>4</sup> (%)	Adequate Prenatal Care <sup>5</sup> (%)
Mary Lane Hospital	Ware	164	-- <sup>7</sup>	45.7	75.6
Massachusetts General Hospital	Boston	3,406	8.3	26.2	86.9
Melrose-Wakefield Hospital	Melrose	1,793	4.4	16.4	88.2
Mercy Medical Center	Springfield	1,310	4.2	56.5	80.5
Metrowest Medical Center-Framingham Union Campus	Framingham	2,263	5.9	20.8	93.5
Milford-Whitinsville Regional Hospital	Milford	980	3.2	18.7	90.7
Morton Hospital	Taunton	626	3.2	37.4	79.5
Mount Auburn Hospital	Cambridge	1,699	2.8	14.2	92.5
Nantucket Cottage Hospital	Nantucket	85	-- <sup>7</sup>	43.5	76.5
New England Medical Center Hospital	Boston	1,575	25.8	32.4	89.7
Newton Wellesley Hospital	Newton	3,211	4.9	1.9	83.1
North Adams Regional Hospital	North Adams	276	4.3	48.0	85.5
North Shore Birth Center	Beverly	87	-- <sup>7</sup>	13.8	83.9
North Shore Medical Center - Salem Hospital	Salem	1,735	6.1	33.7	74.7
Saint Vincent Hospital	Worcester	1,743	4.5	16.2	91.6
Saints Memorial Medical Ctr.	Lowell	704	4.0	35.5	82.3
South Shore Hospital	Weymouth	4,073	4.5	10.0	92.8
St. Elizabeth's Medical Center	Boston	1,510	13.4	17.2	88.3
St. Luke's Hospital	New Bedford	1,509	5.9	52.2	80.4
Sturdy Memorial Hospital	Attleboro	1,128	3.8	18.1	70.7
The Birthplace At Wellesley	Wellesley	94	-- <sup>7</sup>	0.0	89.4
Tobey Hospital	Wareham	502	3.2	28.7	45.9
UMass Memorial Medical Center - West Campus	Worcester	4,383	10.5	29.1	73.8
Winchester Hospital	Winchester	2,427	5.1	5.3	86.9
All Other Hospitals		12	-- <sup>7</sup>	12.5	55.6
Home Births, Enroute, Other		288	9.2	24.9	60.0

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001. 1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. See Glossary for definition of occurrence births. 3. Less than 2,500 grams (5.5 lbs.). 4. Public payment for delivery includes Medicaid/Masshealth, Commonhealth, Medicare, Healthy Start, other government programs, and free care. 5. Based on the APNCU Index. 6. The percentages provided in this row are based on occurrence births and may differ from data presented elsewhere in this book which are based on resident births. 7. Calculations based on values of 1-4 for medical characteristics of facilities with less than 200 births are suppressed based Guidelines for Release of Births Data, Bureau of Health Statistics, Research and Evaluation, Massachusetts Department of Public Health.

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
<b>STATE TOTAL</b>	<b>81,699</b>	<b>80,624</b>	<b>6,060</b>	<b>4,642</b>	<b>395</b>	<b>299</b>
Abington	0	177	7	7	0	0
Acton	1	244	13	3	0	0
Acushnet	0	98	14	5	1	0
Adams	0	86	-- <sup>1</sup>	10	0	0
Agawam	0	238	20	9	0	0
Alford	0	3	0	0	1	1
Amesbury	0	239	23	6	1	1
Amherst	5	192	7	10	2	0
Andover	1	349	12	2	0	0
Aquinnah (Gay Head)	0	3	0	0	0	0
Arlington	1	545	32	5	1	1
Ashburnham	0	61	8	0	0	0
Ashby	0	24	0	0	0	0
Ashfield	0	11	0	0	0	0
Ashland	1	288	18	8	0	0
Athol	0	118	5	15	0	0
Attleboro	1,131	641	46	32	1	1
Auburn	0	154	8	4	1	1
Avon	0	42	8	2	1	1
Ayer	0	105	-- <sup>1</sup>	5	0	0
Barnstable	1,023	442	34	35	3	1
Barre	0	66	-- <sup>1</sup>	7	0	0
Becket	0	22	-- <sup>1</sup>	2	1	1
Bedford	0	148	14	0	1	1
Belchertown	2	178	11	0	0	0
Bellingham	2	255	16	8	1	1
Belmont	0	270	12	1	1	0
Berkley	0	88	5	3	1	1
Berlin	0	28	-- <sup>1</sup>	0	1	1
Bernardston	0	22	0	0	0	0
Beverly	2,412	451	21	14	0	0
Billerica	3	553	34	14	1	0
Blackstone	0	124	11	8	0	0
Blandford	0	11	0	1	0	0
Bolton	0	72	-- <sup>1</sup>	0	0	0
Boston	23,337	8,011	761	664	56	41
Bourne	1	252	15	17	0	0
Boxborough	0	59	-- <sup>1</sup>	2	0	0
Boxford	0	87	5	0	0	0
Boylston	1	55	5	0	0	0
Braintree	2	437	39	11	2	2

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Brewster	0	63	-- <sup>1</sup>	1	0	0
Bridgewater	1	266	18	4	1	1
Brimfield	0	34	-- <sup>1</sup>	4	1	1
Brockton	2,221	1537	149	163	9	9
Brookfield	0	33	-- <sup>1</sup>	0	0	0
Brookline	3	649	60	5	5	5
Buckland	1	9	0	0	0	0
Burlington	2	328	18	3	1	0
Cambridge	2,718	1,071	75	24	7	5
Canton	0	282	14	2	5	5
Carlisle	0	49	5	0	0	0
Carver	0	143	17	6	0	0
Charlemont	1	12	0	1	0	0
Charlton	0	153	6	3	0	0
Chatham	0	35	-- <sup>1</sup>	2	0	0
Chelmsford	3	413	33	10	1	1
Chelsea	1	617	33	90	2	0
Cheshire	0	22	-- <sup>1</sup>	2	0	0
Chester	1	14	-- <sup>1</sup>	2	0	0
Chesterfield	1	14	0	0	0	0
Chicopee	0	639	55	60	3	3
Chilmark	0	7	0	1	0	0
Clarksburg	1	14	0	2	0	0
Clinton	4	181	12	6	0	0
Cohasset	0	88	-- <sup>1</sup>	1	0	0
Colrain	0	15	-- <sup>1</sup>	1	0	0
Concord	1,298	149	9	0	0	0
Conway	1	15	-- <sup>1</sup>	0	0	0
Cummington	0	9	0	0	0	0
Dalton	0	41	0	6	0	0
Danvers	0	233	22	4	0	0
Dartmouth	0	265	13	8	1	1
Dedham	1	309	21	7	1	1
Deerfield	0	48	-- <sup>1</sup>	1	0	0
Dennis	1	136	13	7	1	1
Dighton	1	61	-- <sup>1</sup>	4	0	0
Douglas	0	128	11	7	3	2
Dover	1	67	-- <sup>1</sup>	0	0	0
Dracut	2	369	22	9	1	1
Dudley	0	126	15	5	0	0
Dunstable	0	19	0	0	0	0
Duxbury	0	174	13	1	0	0
East Bridgewater	0	168	17	5	0	0
East Brookfield	0	16	0	0	0	0
East Longmeadow	0	134	9	3	0	0

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Eastham	0	32	0	0	0	0
Easthampton	0	170	16	8	1	1
Easton	0	250	21	3	1	0
Edgartown	0	48	-- <sup>1</sup>	2	0	0
Egremont	0	5	0	0	0	0
Erving	0	11	-- <sup>1</sup>	0	0	0
Essex	0	40	-- <sup>1</sup>	1	0	0
Everett	0	507	42	30	0	0
Fairhaven	0	137	7	10	0	0
Fall River	1,653	1,190	108	158	8	8
Falmouth	637	289	19	24	3	2
Fitchburg	1	556	46	67	6	4
Florida	0	1	0	0	0	0
Foxborough	0	216	6	4	0	0
Framingham	2,265	939	92	41	5	3
Franklin	1	482	38	4	4	3
Freetown	1	102	12	3	0	0
Gardner	583	226	17	23	0	0
Georgetown	0	110	-- <sup>1</sup>	0	0	0
Gill	0	13	-- <sup>1</sup>	1	0	0
Gloucester	0	303	24	18	2	1
Goshen	0	12	0	0	0	0
Gosnold	0	0	0	0	0	0
Grafton	0	220	9	6	0	0
Granby	0	51	-- <sup>1</sup>	3	0	0
Granville	0	13	0	0	0	0
Great Barrington	164	64	-- <sup>1</sup>	3	1	1
Greenfield	452	165	10	19	0	0
Groton	1	116	11	1	1	0
Groveland	0	79	6	2	0	0
Hadley	1	30	-- <sup>1</sup>	1	1	1
Halifax	0	84	-- <sup>1</sup>	3	0	0
Hamilton	1	118	5	0	0	0
Hampden	0	46	-- <sup>1</sup>	1	0	0
Hancock	0	9	0	0	0	0
Hanover	0	160	9	2	0	0
Hanson	0	122	7	2	0	0
Hardwick	0	25	-- <sup>1</sup>	3	1	1
Harvard	0	46	-- <sup>1</sup>	0	1	1
Harwich	1	99	-- <sup>1</sup>	5	1	1
Hatfield	0	25	-- <sup>1</sup>	0	0	0
Haverhill	1	848	71	67	9	8
Hawley	0	0	0	0	0	0
Heath	0	11	0	0	0	0
Hingham	0	273	17	2	1	1



**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Hinsdale	0	20	-- <sup>1</sup>	4	0	0
Holbrook	0	117	8	5	0	0
Holden	2	156	-- <sup>1</sup>	4	0	0
Holland	0	25	0	2	0	0
Holliston	0	176	12	1	1	1
Holyoke	562	620	64	124	7	7
Hopedale	0	70	-- <sup>1</sup>	2	0	0
Hopkinton	1	222	19	4	1	1
Hubbardston	0	55	-- <sup>1</sup>	1	1	0
Hudson	1	237	16	7	2	1
Hull	0	129	-- <sup>1</sup>	4	0	0
Huntington	1	31	-- <sup>1</sup>	3	0	0
Ipswich	0	149	15	2	0	0
Kingston	0	155	6	2	0	0
Lakeville	0	149	8	4	0	0
Lancaster	0	76	-- <sup>1</sup>	2	0	0
Lanesborough	0	24	-- <sup>1</sup>	2	0	0
Lawrence	1,583	1,440	108	227	8	5
Lee	0	61	6	4	3	2
Leicester	0	101	-- <sup>1</sup>	6	0	0
Lenox	0	32	0	0	0	0
Leominster	1,271	546	47	39	1	0
Leverett	1	13	-- <sup>1</sup>	1	0	0
Lexington	1	225	17	1	1	1
Leyden	0	2	-- <sup>1</sup>	0	0	0
Lincoln	3	100	-- <sup>1</sup>	0	0	0
Littleton	0	124	-- <sup>1</sup>	1	0	0
Longmeadow	0	188	18	0	2	2
Lowell	2,794	1,790	141	228	18	11
Ludlow	0	172	6	9	0	0
Lunenburg	0	93	5	2	0	0
Lynn	4	1,457	117	162	9	8
Lynnfield	0	113	-- <sup>1</sup>	0	0	0
Malden	3	814	58	25	4	4
Manchester-by-the-Sea	0	49	-- <sup>1</sup>	0	0	0
Mansfield	0	374	22	6	0	0
Marblehead	0	242	14	1	1	0
Marion	0	46	-- <sup>1</sup>	2	0	0
Marlborough	2	566	52	28	4	4
Marshfield	0	358	19	7	0	0
Mashpee	0	145	15	5	1	1
Mattapoisett	0	44	-- <sup>1</sup>	0	0	0
Maynard	2	169	12	3	0	0
Medfield	0	136	15	1	0	0
Medford	3	640	47	10	2	2

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Medway	0	175	11	0	1	1
Melrose	1,793	379	27	1	1	0
Mendon	0	62	-- <sup>1</sup>	0	0	0
Merrimac	0	68	5	0	0	0
Methuen	1,458	584	50	26	2	2
Middleborough	1	274	19	16	2	2
Middlefield	0	6	0	0	0	0
Middleton	0	91	6	0	0	0
Milford	980	423	42	14	3	3
Millbury	1	151	7	6	2	1
Millis	1	111	7	1	0	0
Millville	0	40	-- <sup>1</sup>	1	0	0
Milton	4	318	17	5	0	0
Monroe	0	2	0	0	0	0
Monson	0	98	9	4	1	1
Montague	2	92	7	13	0	0
Monterey	1	6	0	0	0	0
Montgomery	0	8	-- <sup>1</sup>	0	0	0
Mount Washington	0	0	0	0	0	0
Nahant	0	33	6	1	0	0
Nantucket	87	137	12	4	2	1
Natick	4	528	34	1	1	1
Needham	1	343	17	1	0	0
New Ashford	0	5	0	0	0	0
New Bedford	1,514	1,321	102	175	10	4
New Braintree	0	8	0	0	0	0
New Marlborough	0	16	-- <sup>1</sup>	2	0	0
New Salem	0	12	0	0	0	0
Newbury	0	92	12	2	0	0
Newburyport	936	234	15	7	4	3
Newton	3,216	822	56	9	3	3
Norfolk	1	138	10	1	0	0
North Adams	276	144	12	20	1	1
North Andover	0	328	11	3	1	1
North Attleboro	2	358	17	12	1	1
North Brookfield	0	53	-- <sup>1</sup>	1	0	0
North Reading	0	167	16	4	1	0
Northampton	881	203	4	10	0	0
Northborough	1	169	10	2	0	0
Northbridge	0	215	16	12	1	1
Northfield	1	18	0	0	0	0
Norton	0	269	22	8	2	2
Norwell	0	135	7	1	1	1
Norwood	642	387	22	6	0	0
Oak Bluffs	156	64	6	2	0	0

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Oakham	0	15	0	0	0	0
Orange	0	88	9	12	0	0
Orleans	0	35	0	0	0	0
Otis	0	7	0	0	0	0
Oxford	1	158	9	7	1	1
Palmer	1	123	6	10	2	1
Paxton	0	32	-- <sup>1</sup>	1	0	0
Peabody	2	514	46	10	1	0
Pelham	1	8	0	0	0	0
Pembroke	0	255	16	7	2	1
Pepperell	1	155	12	6	2	2
Peru	0	9	-- <sup>1</sup>	1	0	0
Petersham	1	10	0	1	0	0
Phillipston	0	17	-- <sup>1</sup>	3	0	0
Pittsfield	777	528	51	61	1	0
Plainfield	0	5	-- <sup>1</sup>	1	0	0
Plainville	0	117	-- <sup>1</sup>	4	2	2
Plymouth	771	715	58	22	2	1
Plympton	1	27	0	0	0	0
Princeton	0	31	-- <sup>1</sup>	2	0	0
Provincetown	0	14	-- <sup>1</sup>	2	0	0
Quincy	2	1,154	73	31	6	4
Randolph	0	418	51	16	3	2
Raynham	0	140	14	4	0	0
Reading	2	313	22	1	0	0
Rehoboth	1	104	9	0	1	1
Revere	2	649	50	51	2	2
Richmond	0	8	0	1	0	0
Rochester	0	52	-- <sup>1</sup>	1	0	0
Rockland	0	248	12	6	0	0
Rockport	0	63	-- <sup>1</sup>	2	0	0
Rowe	0	4	-- <sup>1</sup>	0	0	0
Rowley	0	72	8	0	0	0
Royalston	0	6	0	1	0	0
Russell	2	19	0	1	1	0
Rutland	0	101	6	6	0	0
Salem	1,736	540	42	25	3	3
Salisbury	0	100	14	7	0	0
Sandisfield	0	6	0	2	0	0
Sandwich	0	184	5	3	1	1
Saugus	1	253	13	7	0	0
Savoy	0	7	-- <sup>1</sup>	0	0	0
Scituate	1	219	21	0	0	0
Seekonk	0	140	-- <sup>1</sup>	2	1	1
Sharon	0	181	15	1	0	0

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths,  
Massachusetts Municipalities: 2002**

<b>Community</b>	<b>Occurrence Births<sup>2</sup></b>	<b>Resident Births<sup>3</sup></b>	<b>Low Birthweight<sup>4</sup></b>	<b>Teen Births (15-19 years)</b>	<b>Infant Deaths<sup>5</sup></b>	<b>Neonatal Deaths<sup>6</sup></b>
Sheffield	1	23	0	2	0	0
Shelburne	0	17	-- <sup>1</sup>	1	0	0
Sherborn	0	49	0	0	0	0
Shirley	1	74	5	2	0	0
Shrewsbury	0	485	31	7	2	2
Shutesbury	0	14	0	1	0	0
Somerset	0	126	10	6	1	1
Somerville	2	905	69	50	1	1
South Hadley	0	156	5	5	3	3
Southampton	0	50	7	0	0	0
Southborough	1	133	9	1	0	0
Southbridge	482	231	19	28	4	3
Southwick	0	85	-- <sup>1</sup>	3	1	0
Spencer	0	131	10	6	0	0
Springfield	5,700	2,357	255	423	23	16
Sterling	2	84	6	4	0	0
Stockbridge	0	15	0	1	0	0
Stoneham	0	258	26	2	0	0
Stoughton	3	320	20	9	0	0
Stow	0	73	-- <sup>1</sup>	0	1	0
Sturbridge	1	98	-- <sup>1</sup>	1	1	0
Sudbury	0	223	15	1	1	1
Sunderland	1	32	-- <sup>1</sup>	0	0	0
Sutton	1	110	-- <sup>1</sup>	3	0	0
Swampscott	0	167	7	2	0	0
Swansea	0	131	16	2	1	1
Taunton	626	752	57	57	6	5
Templeton	2	88	0	9	0	0
Tewksbury	1	373	25	6	0	0
Tisbury	1	48	6	1	0	0
Tolland	0	3	0	0	0	0
Topsfield	0	51	7	0	0	0
Townsend	0	99	-- <sup>1</sup>	7	0	0
Truro	1	15	0	1	0	0
Tyngsborough	0	147	9	3	0	0
Tyringham	0	3	0	0	0	0
Upton	0	103	9	1	0	0
Uxbridge	0	179	7	5	0	0
Wakefield	0	348	19	4	1	1
Wales	0	16	0	0	0	0
Walpole	0	293	20	1	0	0
Waltham	4	672	47	24	4	4
Ware	164	129	15	10	2	1
Wareham	503	272	12	33	3	2
Warren	0	70	14	6	1	1

**Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2002**

Community	Occurrence Births <sup>2</sup>	Resident Births <sup>3</sup>	Low Birthweight <sup>4</sup>	Teen Births (15-19 years)	Infant Deaths <sup>5</sup>	Neonatal Deaths <sup>6</sup>
Warwick	0	5	0	1	0	0
Washington	0	4	0	1	0	0
Watertown	1	363	29	7	2	1
Wayland	0	143	13	1	0	0
Webster	1	215	24	22	0	0
Wellesley	94	346	22	0	0	0
Wellfleet	0	23	0	2	0	0
Wendell	0	7	-- <sup>1</sup>	0	0	0
Wenham	0	38	-- <sup>1</sup>	0	0	0
West Boylston	0	53	6	1	3	3
West Bridgewater	0	67	5	1	0	0
West Brookfield	0	40	-- <sup>1</sup>	3	0	0
West Newbury	0	49	-- <sup>1</sup>	0	0	0
West Springfield	1	339	27	12	3	2
West Stockbridge	0	13	0	0	0	0
West Tisbury	1	17	-- <sup>1</sup>	0	0	0
Westborough	0	240	14	5	0	0
Westfield	2	458	33	28	0	0
Westford	2	273	28	3	0	0
Westhampton	0	15	-- <sup>1</sup>	0	0	0
Westminster	0	78	6	3	1	1
Weston	0	106	-- <sup>1</sup>	0	0	0
Westport	0	128	10	7	0	0
Westwood	0	175	9	1	0	0
Weymouth	4,075	702	55	21	2	2
Whately	0	15	-- <sup>1</sup>	1	0	0
Whitman	1	208	20	8	1	1
Wilbraham	0	89	0	0	0	0
Williamsburg	0	20	0	1	0	0
Williamstown	0	35	6	0	0	0
Wilmington	0	302	22	3	1	1
Winchendon	0	138	6	13	0	0
Winchester	2,429	266	17	1	0	0
Windsor	1	7	0	0	0	0
Winthrop	0	179	5	4	0	0
Woburn	2	476	39	8	2	1
Worcester	6,148	2,617	197	226	23	16
Worthington	0	5	0	0	0	0
Wrentham	0	131	8	2	1	1
Yarmouth	0	202	13	11	0	0

1. Values of 1-4 for medical characteristics of communities with less than 200 births are suppressed based on Guidelines for Release of Birth Data, Bureau of Health Statistics, Research and Evaluation, Massachusetts Department of Public Health. 2. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details. 3. Births to mothers who report their usual place of residence as a particular geographical place (state, or city/town). See Glossary for more details. 4. Less than 2,500 grams (5.5 lbs.). 5. Death of a child whose age is less than one year. 6. Death of a child whose age is less than 28 days.

**Table 25B. Birth Characteristics, Occurrence and Resident Births and Infant Deaths by County, Massachusetts: 2002**

County Name	Occurrence Births <sup>1</sup>	Resident Births <sup>2</sup>		Deaths	
		Number	Low Birthweight <sup>3</sup>	Teen Births (15-19 years)	Infant <sup>4</sup> Neonatal <sup>5</sup>
<b>STATE TOTAL</b>	<b>81,699</b>	<b>80,624</b>	<b>6,060</b>	<b>4,642</b>	<b>395 299</b>
Barnstable	1,664	1,966	122	115	10 7
Berkshire	1,221	1,240	94	126	8 6
Bristol	4,929	6,675	512	505	36 27
Dukes	158	187	14	6	0 0
Essex	8,135	9,584	701	598	41 32
Franklin	460	653	48	53	0 0
Hampden	6,269	5,729	513	696	44 33
Hampshire	1,056	1,309	77	52	9 6
Middlesex	16,563	18,773	1,355	608	74 53
Nantucket	87	137	12	4	2 1
Norfolk	4,833	8,389	592	150	34 30
Plymouth	3,500	6,457	470	309	22 19
Suffolk	23,340	9,456	849	809	60 43
Worcester	9,484	10,069	701	611	57 42

1. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details.

2. Births to mothers who report their usual place of residence as a particular geographical place (state, or city/town). See Glossary for more details. 3. Less than 2,500 grams (5.5 lbs.). 4. Death of a child whose age is less than one year. 5. Death of a child whose age is less than 28 days.

**Table 25C. Birth Characteristics, Occurrence and Resident Births and Infant Deaths,  
Massachusetts Community Health Network Areas (CHNAs): 2002**

Community Health Network Area	Occurrence Births <sup>1</sup>	Resident Births <sup>2</sup>			Deaths	
		Number	Low Birthweight <sup>3</sup>	Teen Births (15-19 years)	Infant <sup>4</sup>	Neonatal <sup>5</sup>
<b>STATE TOTAL</b>	<b>81,699</b>	<b>80,624</b>	<b>6,060</b>	<b>4,642</b>	<b>397</b>	<b>299</b>
Community Health Network of Berkshire County	1,221	1,240	94	126	8	6
Upper Valley Health Web (Franklin County)	461	804	55	73	0	0
Partnership for Health in Hampshire County (Northampton)	1,055	1,278	75	49	9	6
The Community Health Connection (Springfield)	5,704	3,751	350	467	33	22
Community Health Network of Southern Worcester County	485	1,399	106	88	8	6
Community Partners for Health (Milford)	984	2,366	170	65	13	11
Community Health Network of Greater Metro West (Framingham)	2,280	5,297	387	117	19	15
Community Wellness Coalition (Worcester)	6,152	4,024	271	261	31	23
Fitchburg/Gardner Community Health Network	1,866	3,147	218	208	15	10
Greater Lowell Community Health Network	2,805	3,937	292	273	21	13
Greater Lawrence Community Health Network	3,042	2,792	187	258	11	8
Greater Haverhill Community Health Network	937	1,978	165	91	14	12
Community Health Network North (Beverly/Gloucester)	2,413	1,262	79	37	2	1
North Shore Community Health Network	1,743	3,552	270	212	14	11
Greater Woburn/Concord/Littleton Community Health Network	3,736	2,470	163	22	6	4
North Suburban Health Alliance (Medford/Malden/Melrose)	1,801	3,426	257	77	9	7
Greater Cambridge/Somerville Community Health Network	2,722	3,154	217	87	12	8
West Suburban Health Network (Newton/Waltham)	3,317	2,840	177	42	8	8
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	23,343	10,105	909	814	65	48
Blue Hills Community Health Alliance (Greater Quincy)	4,726	4,723	337	101	20	17
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	566	1,934	162	226	10	10
Greater Brockton Community Health Network	2,226	3,152	273	207	13	12
South Shore Community Partners in Prevention (Plymouth)	772	2,441	161	58	4	2
Greater Attleboro-Taunton Health & Education Response	1,762	3,350	226	148	15	14
Partners for a Healthier Community (Fall River)	1,653	1,575	144	173	10	10
Greater New Bedford Health & Human Services Coalition	2,018	2,337	167	237	15	7
Cape and Islands Community Health Network	1,909	2,290	148	125	12	8

1. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details. 2. Births to mothers who report their usual place of residence as a particular geographical place (state, city/town). See Glossary for more details. 3. Less than 2,500 grams (5.5 lbs.). 4. Death of a child whose age is less than one year. 5. Death of a child whose age is less than 28 days.





## **APPENDIX**



## TECHNICAL NOTES

### 1. DATA AVAILABILITY

This publication and other Department of Public Health publications and materials can be accessed on the Internet at:

<http://www.state.ma.us/dph/pubstats.htm>

Detailed information on 2002 births in Massachusetts, as well as access to other Department of Public Health data, is available on the Department's free, Internet-accessible data warehouse, **MassCHIP**. To register as a user, visit the MassCHIP website at <http://masschip.state.ma.us>, or call 1-888-MASCHIP (within MA only) or (617) 988-3359.

### 2. DATA CAUTIONS

#### Limitations of small numbers:

Cells in some tables in this publication, and particularly those tables specific to the individual cities and towns, contain small numbers. Rates and proportions based on less than five observations are suppressed, and trends based upon small numbers should be interpreted cautiously.

#### Differences with previously published data

Numbers and rates in this publication may differ from those contained in previous reports because of updates of birth and death certificate files, or release of the most up-to-date population estimates for a given year (see Technical Note #4 for details on population files).

#### Self-reported data

Many items used in this publication, such as maternal smoking, education, and race/ethnicity are self-reported, and are subject to the usual limitations of this type of information.

### 3. CHANGES IN THE COLLECTION OF RACE AND ETHNICITY INFORMATION

#### Assignment of an Infant's Race/Ethnicity

Prior to 1989, the race/ethnicity of an infant was assigned by combining information on the race/ethnicity of the mother and the race/ethnicity of the father. Since 1989, Massachusetts has followed the recommendation of the National Center for Health Statistics of classifying births according to the self-reported race/ethnicity of the mother. Therefore, beginning in 1989, the race/ethnicity of an infant is identical to the self-reported race/ethnicity of the infant's mother.

#### Addition of Information on Hispanic Ethnicity

Beginning in 1986, an identifier for Hispanic ethnicity was added to the birth certificate; in 1989, an identifier for Hispanic ethnicity was added to the death certificate. Prior to these changes, most infants and mothers of Hispanic ethnicity were included with whites and it was not possible to accurately calculate Hispanic-specific rates of natality and mortality.

### 4. POPULATION ESTIMATES

**The source of the 2000 population estimates for Massachusetts is the Massachusetts Department of Public Health (DPH) Race-Allocated Census 2000 Estimates (MRACE) file.** This file is based upon the U.S. Census 2000 SF1 file (released June, 2001) for Massachusetts, which contains data on population and housing for the 351 towns, 14 counties, and the state overall.

The MRACE file was derived from the Census 2000 file by allocating persons who indicated “some other race” or multiple races to the conventional DPH race categories: “White”, “Black or African American”, “Asian,” “Native American,” and “Hispanic.” In Census 2000, unlike previous censuses, respondents were able to classify themselves by Hispanic ethnicity and by single or multi-race categories, including “some other race.” In order to make the DPH population 2000 file consistent with previous years’ population files, the MRACE file maintains the prior mutually exclusive race and Hispanic categories.

Population-based rates between 1991 and 1999 in this publication were calculated as follows:

- 1991-1998: Massachusetts Institute for Social and Economic Research (MISER) Population Estimates;
- 1999: Massachusetts Dept. of Public Health 1999 Population Estimate, which is a linear interpolation between the preliminary DPH Population 2000 file and the MISER 1998 Population Estimate.

## 5. DEFINITION AND IDENTIFICATION OF PREGNANCY-ASSOCIATED AND MATERNAL DEATHS

There are various ways to categorize a woman who dies during pregnancy, childbirth, or in the postpartum period. Two components are included in every definition of maternal death: the timing of death in relation to the pregnancy and birth, and the causes of death. Two definitions are used in this report: maternal death and pregnancy-associated death. The traditional definition of maternal death can be found in the World Health Organization’s *International Classification of Diseases* (ICD). WHO defines maternal deaths as women who died during pregnancy or within 42 days of delivery from causes related to pregnancy, childbirth or its management. Deaths from accidental or incidental causes are excluded. The National Center for Health Statistics uses the WHO definition to conduct surveillance on maternal death in the US.

Maternal deaths are restricted to women whose underlying causes of death were coded with ICD-9 codes 630-676 (from 1990-1998), or with ICD-10 codes O00-O99 (1999 forward).

The definition of a pregnancy-associated death was developed in 1986 by the Maternal Mortality Study Group, which is jointly chaired by American College of Obstetrics and Gynecology (ACOG) and the Centers for Disease Control and Prevention (CDC). Pregnancy-associated deaths differ from maternal deaths in two fundamental ways: all deaths are included irrespective of cause, and deaths that occurred between 42 and 364 days after delivery also are included.

## 6. CHANGE IN MEASUREMENT OF ADEQUACY OF PRENATAL CARE

Beginning with last year’s publication (*Massachusetts Births 2001*), adequacy of prenatal care is being measured using a new method. The Adequacy of Prenatal Care Utilization (APNCU) Index, developed by Dr. Milton Kotelchuck, has replaced the Kessner Index, which has been used to date in the *Advanced Data Births* and *Massachusetts Births* series. The APNCU Index is the standard used in Healthy People 2010 and by the majority of states. It improves upon the Kessner Index in various ways, the most important being the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to insufficient prenatal care visits. The APNCU Index also improves upon the Kessner Index by correcting some of its principal faults. First, the APNCU Index more accurately assesses adequacy of visits for term pregnancies; the Kessner Index characterizes 9 or more visits as adequate, due to an early computer database limitation, which only allowed for a single-digit number to record prenatal care visits. Other faults of the Kessner Index include its bias towards measurement of adequacy of initiation of care, and its various computational algorithms due to inadequate initial documentation.

Table 1 of this report provides a comparison of data on adequacy of prenatal care from 1996-2002 as measured by these two separate indices. Below are the definitions for the APNCU Index categories and its two component indices (initiation and received services), and the definition of the Kessner Index categories. Also below is a short summary of the major differences in classification of adequacy of prenatal care using the Kessner Index and the APNCU Index.

### Adequacy of Prenatal Care Utilization (APNCU) Index: Definition of Categories

<b>Category</b>	<b>Month Prenatal Care Began</b>	<b>% of Expected<sup>1</sup> Prenatal Care Visits</b>
Adequate Intensive	1, 2, 3, or 4	110% or more
Adequate Basic	1, 2, 3, or 4	80 – 109%
Intermediate	1, 2, 3, or 4	50 – 79%
Inadequate	Month 5 or later	Less than 50%
Unknown	Prenatal care information not recorded	

### Component Indices of the APNCU Index: Definitions of Categories

#### Adequacy of Initiation Index

<b>Category</b>	<b>Month Prenatal Care Began</b>
Adequate Intensive	1 or 2
Adequate Basic	3 or 4
Intermediate	5 or 6
Inadequate	Month 7 or later, or no PNC
Unknown	Prenatal care initiation information not recorded

#### Adequacy of Received Services (Visits) Index

<b>Category</b>	<b>% of Expected<sup>1</sup> Prenatal Care Visits</b>
Adequate Intensive	110% or more
Adequate Basic	80 – 109%
Intermediate	50 – 79%
Inadequate	Less than 50%
Unknown	Information on prenatal care visits not recorded

### Kessner Index of Adequacy of Prenatal Care: Definition of Categories

<b>Category</b>	<b>Trimester Care Began</b>	<b>Number of Visits</b>
Adequate	1	9 or more
Intermediate	1	5-8
	2	5 or more
Inadequate	1	1-4
	2	1-4
	3	1 or more
No prenatal care	--	0
Unknown	Unknown	Unknown

### Summary of Major Differences in Categorization of Adequacy of Prenatal Care between the Kessner Index and the APNCU Index

The two different methods used in the Kessner Index and APNCU Index to calculate adequacy of prenatal care can result in differences in how each one classifies adequacy of prenatal care. These differences only occur under certain conditions, not in all cases (see "Explanation" column).

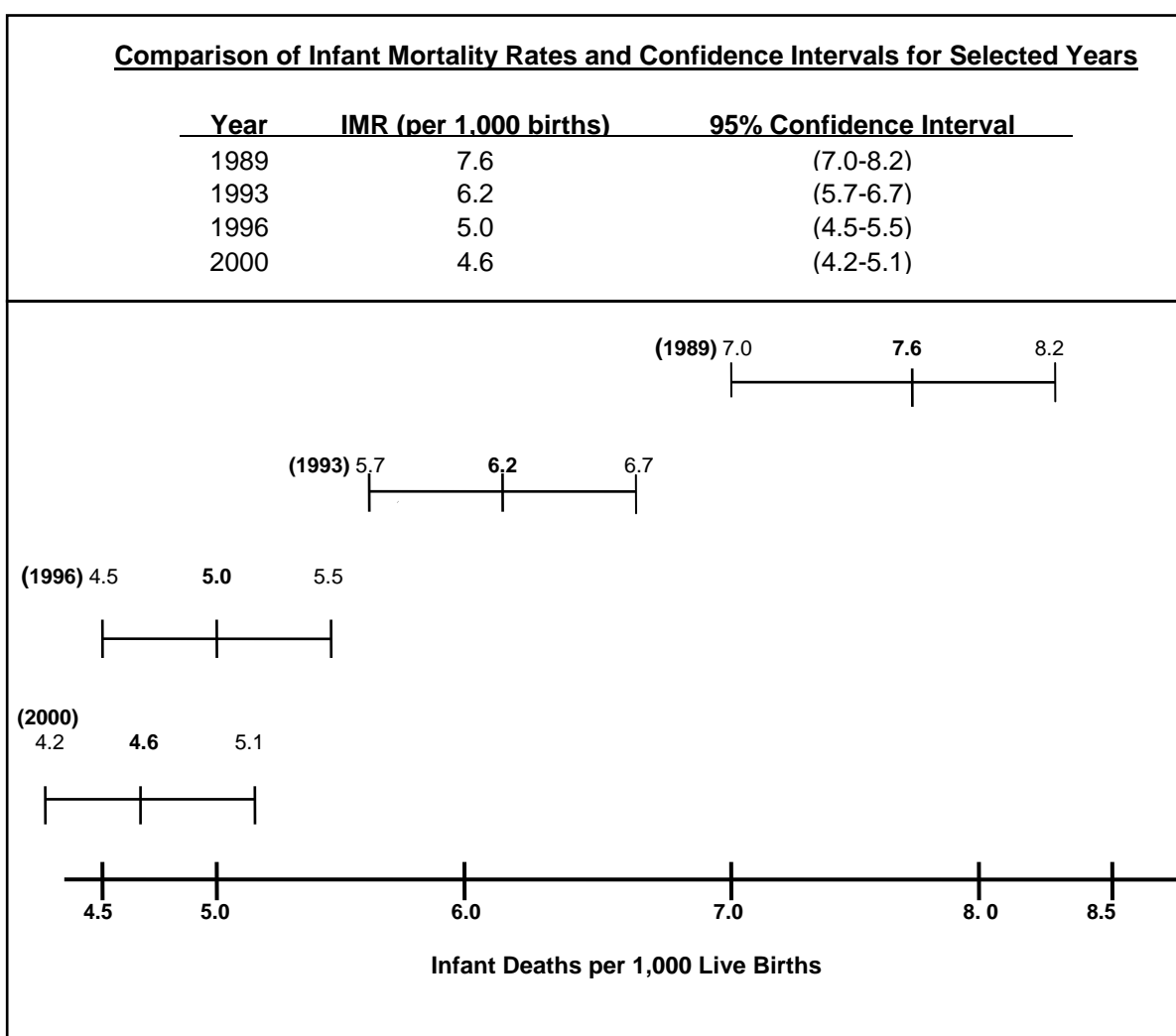
The Kessner Index classifies prenatal care as...	... but the APNCU Index classifies prenatal care as ...	Explanation
Intermediate	Adequate Basic	This is primarily due to the fact that the APNCU Index allows for prenatal care in the 4 <sup>th</sup> month of pregnancy to be considered adequate if the mother received 80-109% of expected visits, whereas the Kessner Index only allows for care begun in the first trimester (months 1-3) to be considered adequate.
Intermediate	Inadequate	This is primarily due to the fact that the APNCU categorizes any prenatal care beginning after month 4 as "inadequate" whereas the Kessner Index allows for care beginning in months 5 or 6 with 5 or more visits to be "intermediate."
Adequate	Intermediate	This is primarily due to the consideration of "expected" visits (based on when the mother initiated care and the length of gestation) using the APNCU Index, which bases expected visits on the ACOG recommendations, <sup>1</sup> which can be as high as 14 visits if a gestational period is 40 weeks, whereas the Kessner Index considers 9 visits sufficient in all cases.
Adequate	Adequate Intensive	The APNCU Index added an "Adequate Intensive" category, which is not used in the Kessner Index. This allows analysis of situations in which more than normal care is received (e.g. women with high risk conditions, pregnancy complications).

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1. The number of "expected" visits is determined based on standards set by the American College of Obstetricians and Gynecologists (ACOG).

## CONFIDENCE INTERVALS AND INFANT MORTALITY RATES

Beginning in the 1992 Advance Data: Births publication, 95% confidence intervals were added to the calculation of infant mortality rates (IMRs). The confidence interval (CI) provides a measure of stability of the IMR and a basis for comparing rates to determine if they are statistically different. Rates can be compared for the same group in different years, or for different groups in the same year. The width of the CI reflects the stability of the IMR. For example, a narrow CI reflects high stability, and a wide interval reflects low stability. If the CIs around two IMRs being compared do not overlap, the difference between the two rates is statistically significant. The following table and chart illustrate the concept of statistically significant differences using actual data from 1989, 1993, 1996, and 2000.



The difference between the 1993 IMR and 1996 IMR is statistically significant -- the confidence intervals do not overlap. The same is true for the differences between the 1989 IMR and each annual IMR for 1993, 1996, and 2000. However, the difference between the 1996 and 2000 IMRs is not statistically significant, since their confidence intervals overlap.





**95% Confidence Intervals for Infant Mortality Rates, by Race and Hispanic Ethnicity, Massachusetts: 1990-2002**

<b>Year</b>	<b>Total<sup>1</sup></b>		<b>White non-Hispanic</b>		<b>Black non-Hispanic</b>		<b>Hispanic</b>		<b>Asian</b>	
	<b>n</b>	<b>Rate<sup>2</sup> (C.I.)</b>	<b>n</b>	<b>Rate<sup>2</sup> (C.I.)</b>	<b>n</b>	<b>Rate<sup>2</sup> (C.I.)</b>	<b>n</b>	<b>Rate<sup>2</sup> (C.I.)</b>	<b>n</b>	<b>Rate<sup>2</sup> (C.I.)</b>
1990	649	<b>7.0</b> (6.5, 7.5)	442	<b>6.1</b> (5.5, 6.7)	98	<b>13.7</b> (11.0, 16.4)	77	<b>9.1</b> (7.1, 11.1)	24	<b>7.0</b> (4.2, 10.0)
1991	577	<b>6.5</b> (6.0, 7.0)	381	<b>5.5</b> (4.9, 6.1)	101	<b>15.0</b> (12.1, 17.9)	80	<b>9.4</b> (7.3, 11.5)	14	<b>4.2</b> (2.0, 6.4)
1992	569	<b>6.5</b> (6.0, 7.0)	371	<b>5.5</b> (4.9, 6.1)	110	<b>16.4</b> (13.4, 19.4)	67	<b>7.9</b> (6.0, 9.8)	16	<b>4.9</b> (2.5, 7.3)
1993	523	<b>6.2</b> (5.7, 6.7)	346	<b>5.3</b> (4.7, 5.9)	84	<b>13.1</b> (10.3, 15.9)	77	<b>9.3</b> (7.2, 11.4)	13	<b>3.9</b> (1.8, 6.0)
1994	499	<b>6.0</b> (5.4, 6.5)	343	<b>5.3</b> (4.7, 5.9)	79	<b>12.6</b> (9.8, 15.4)	64	<b>7.6</b> (5.7, 9.4)	8	<b>2.4</b> (0.7, 4.0)
1995	419	<b>5.1</b> (4.6, 5.6)	275	<b>4.4</b> (3.8, 4.9)	65	<b>11.1</b> (8.4, 13.8)	58	<b>7.2</b> (5.3, 9.0)	19	<b>5.5</b> (3.0, 8.0)
1996	403	<b>5.0</b> (4.5, 5.5)	289	<b>4.7</b> (4.1, 5.2)	63	<b>11.4</b> (8.6, 14.2)	40	<b>5.1</b> (3.5, 6.7)	8	<b>2.2</b> (0.7, 3.7)
1997	425	<b>5.3</b> (4.8, 5.8)	294	<b>4.8</b> (4.2, 5.3)	64	<b>11.7</b> (8.8, 14.5)	55	<b>6.7</b> (4.9, 8.4)	10	<b>2.6</b> (1.0, 4.2)
1998	414	<b>5.1</b> (4.6, 5.6)	294	<b>4.6</b> (4.1, 5.2)	64	<b>10.6</b> (7.9, 13.3)	55	<b>6.7</b> (5.0, 8.4)	10	<b>2.7</b> (1.0, 4.3)
1999	418	<b>5.2</b> (4.7, 5.7)	285	<b>4.7</b> (4.2, 5.3)	72	<b>12.3</b> (9.5, 15.1)	49	<b>5.5</b> (4.0, 7.1)	8	<b>1.9</b> (0.6, 3.3)
2000	377	<b>4.6</b> (4.2, 5.1)	232	<b>3.8</b> (3.4, 4.3)	74	<b>12.8</b> (9.9, 15.7)	48	<b>5.2</b> (3.7, 6.6)	19	<b>4.1</b> (2.2, 5.9)
2001	407	<b>5.0</b> (4.5, 5.5)	245	<b>4.1</b> (3.6, 4.7)	71	<b>12.1</b> (9.3, 14.9)	69	<b>7.3</b> (5.6, 9.1)	15	<b>3.1</b> (1.6, 4.7)
2002	397	<b>4.9</b> (4.4, 5.4)	239	<b>4.1</b> (3.6, 4.6)	69	<b>11.6</b> (8.9, 14.3)	67	<b>7.0</b> (5.3, 8.7)	16	<b>3.0</b> (1.5, 4.5)

<sup>1</sup>Deaths of infants of unknown race are excluded except for the total calculation. For rate computations, births of infants of unknown race are allocated into the race categories according to the distribution of births of known race.

<sup>2</sup>Rates are expressed per 1,000 live births.

In 2002, the black non-Hispanic infant mortality rate was 11.6 deaths per 1,000 live births (95% CI: 8.9, 14.3), which was almost three times greater than the white non-Hispanic infant mortality rate of 4.1 (95% CI: 3.6, 4.6). The difference in these two rates was statistically significant. The rate of infant mortality for black non-Hispanics was also significantly elevated compared to both Hispanics (95% CI: 5.3, 8.7) and Asians (95% CI: 1.5, 4.5) in 2002.

## DEFINITION OF RATES

### Age-Specific Birth Rate

The number of children born to women in a specific age group divided by the population of women in that specific age group, multiplied by 1,000.

$$\text{Age-Specific Birth Rate} = \frac{\text{Number of births to females ages X to Y years}}{\text{Number of females ages X to Y years in the population}} \times 1,000$$

### Birth Rate

(See Age-Specific Birth Rate, Crude Birth Rate, Fertility Rate, and Teen Birth Rate)

### Cesarean Section Rates

$$\text{Total C-section rate} = \frac{\text{Number of C-section births}}{\text{Number of occurrence births}} \times 100$$

$$\text{Primary C-section rate} = \frac{\text{Number of primary C-section births}}{[\text{Number of occurrence births} - (\text{number of repeat C-section births} + \text{VBACs})]} \times 100$$

$$\text{Repeat C-section rate} = \frac{\text{Number of repeat C-section births}}{(\text{Number of repeat C-section births} + \text{number of VBACs})} \times 100$$

$$\text{VBAC rate} = \frac{\text{Number of VBACs}}{(\text{Number of repeat C-section births} + \text{number of VBACs})} \times 100$$

### Crude Birth Rate

$$\text{Crude Birth rate} = \frac{\text{Number of resident live births}}{\text{Total resident population}} \times 1,000$$

### Fertility Rate (sometimes referred to as "Birth Rate")

$$\text{Fertility rate} = \frac{\text{Number of births to females ages 15-44 years}}{\text{Number of females ages 15-44 years in the population}} \times 1,000$$

### Fetal Mortality Rate

$$\text{Fetal Mortality Rate} = \frac{\text{Number of fetal deaths}}{\text{Number of fetal deaths plus live births in the same year}} \times 1,000$$

#### Infant Mortality Rate (IMR)

The death rate among infants less than one year old, per 1,000 live births.

$$\text{Infant Mortality Rate} = \frac{\text{Number of resident deaths of infants less than one year old in a year}}{\text{Number of resident live births in the same year}} \times 1,000$$

#### Maternal Mortality Ratio (MMR)

The number of maternal deaths per 100,000 live occurrence births. The term "ratio" is used instead of "rate" in this report because the numerator includes some maternal deaths that were not related to live-born infants and thus were not included in the denominator.

$$\text{Maternal Mortality Ratio (MMR)} = \frac{\text{Number of maternal deaths}}{\text{Number of occurrence live births in the same year}} \times 100,000$$

#### Neonatal Mortality Rate (NMR)

The death rate among infants less than 28 days of age, per 1,000 live births.

$$\text{Neonatal Mortality Rate} = \frac{\text{Number of resident deaths of infants less than 28 days of age in a year}}{\text{Number of resident live births in the same year}} \times 1,000$$

#### Perinatal Mortality Rate

$$\text{Perinatal Mortality Rate} = \frac{\text{Number of fetal deaths from 28 weeks gestation plus infant deaths (less than 7 days old)}}{\text{Number of fetal deaths plus live births in the same year}} \times 1,000$$

#### Post Neonatal Mortality Rate

The death rate among infants 28 days of age to less than one year old, per 1,000 live births.

$$\text{Post Neonatal Mortality Rate} = \frac{\text{Number of resident deaths of infants 28 days of age to less than one year of age in a year}}{\text{Number of resident live births in the same year}} \times 1,000$$

### Pregnancy-Associated Mortality Ratio (PAMR)

The number of pregnancy-associated deaths per 100,000 live occurrence births. The term "ratio" is used instead of rate in this report because the numerator includes some maternal deaths that were not related to live-born infants and thus were not included in the denominator.

$$\text{Pregnancy-Associated Mortality Ratio (PAMR)} = \frac{\text{Number of pregnancy-associated deaths}}{\text{Number of occurrence live births in the same year}} \times 100,000$$

### Teen Birth Rate

$$\text{Teen birth rate} = \frac{\text{Number of births to females ages 15-19 years old}}{\text{Number of females ages 15-19 years old in the population}} \times 1,000$$

### Total Rate of Change

Total rate of change between two numbers or rates is expressed as a percentage in this report (e.g. The Massachusetts birth rate decreased by 12% from 1990 to 1996.):

$$\frac{P_n - P_o}{P_o} \times 100$$

Where,

P<sub>n</sub> = rate during later time period

P<sub>o</sub> = rate during earlier time period

### Population Estimates for Massachusetts Communities, 2000

TOWN NAME	COUNTY	CHNA	POPULATION	TOWN NAME	COUNTY	CHNA	POPULATION
Abington	Plymouth	22	14,605	Concord	Middlesex	15	16,993
Acton	Middlesex	15	20,331	Conway	Franklin	2	1,809
Acushnet	Bristol	26	10,161	Cummington	Hampshire	3	978
Adams	Berkshire	1	8,809	Dalton	Berkshire	1	6,892
Agawam	Hampden	4	28,144	Danvers	Essex	14	25,212
Alford	Berkshire	1	399	Dartmouth	Bristol	26	30,666
Amesbury	Essex	12	16,450	Dedham	Norfolk	18	23,464
Amherst	Hampshire	3	34,874	Deerfield	Franklin	2	4,750
Andover	Essex	11	31,247	Dennis	Barnstable	27	15,973
Aquinnah (Gay Head)	Dukes	27	344	Dighton	Bristol	24	6,175
Arlington	Middlesex	17	42,389	Douglas	Worcester	6	7,045
Ashburnham	Worcester	9	5,546	Dover	Norfolk	18	5,558
Ashby	Middlesex	9	2,845	Dracut	Middlesex	10	28,562
Ashfield	Franklin	2	1,800	Dudley	Worcester	5	10,036
Ashland	Middlesex	7	14,674	Dunstable	Middlesex	10	2,829
Athol	Worcester	2	11,299	Duxbury	Plymouth	23	14,248
Attleboro	Bristol	24	42,068	East Bridgewater	Plymouth	22	12,974
Auburn	Worcester	8	15,901	East Brookfield	Worcester	5	2,097
Avon	Norfolk	22	4,443	East Longmeadow	Hampden	4	14,100
Ayer	Middlesex	9	7,287	Eastham	Barnstable	27	5,453
Barnstable	Barnstable	27	47,821	Easthampton	Hampshire	3	15,994
Barre	Worcester	9	5,113	Easton	Bristol	22	22,299
Becket	Berkshire	1	1,755	Edgartown	Dukes	27	3,779
Bedford	Middlesex	15	12,595	Egremont	Berkshire	1	1,345
Belchertown	Hampshire	3	12,968	Erving	Franklin	2	1,467
Bellingham	Norfolk	6	15,314	Essex	Essex	13	3,267
Belmont	Middlesex	17	24,194	Everett	Middlesex	16	38,037
Berkley	Bristol	24	5,749	Fairhaven	Bristol	26	16,159
Berlin	Worcester	9	2,380	Fall River	Bristol	25	91,938
Bernardston	Franklin	2	2,155	Falmouth	Barnstable	27	32,660
Beverly	Essex	13	39,862	Fitchburg	Worcester	9	39,102
Billerica	Middlesex	10	38,981	Florida	Berkshire	1	676
Blackstone	Worcester	6	8,804	Foxborough	Norfolk	7	16,246
Blandford	Hampden	4	1,214	Framingham	Middlesex	7	66,910
Bolton	Worcester	9	4,148	Franklin	Norfolk	6	29,560
Boston	Suffolk	19	589,141	Freetown	Bristol	26	8,472
Bourne	Barnstable	27	18,721	Gardner	Worcester	9	20,770
Boxborough	Middlesex	15	4,868	Georgetown	Essex	12	7,377
Boxford	Essex	12	7,921	Gill	Franklin	2	1,363
Boylston	Worcester	8	4,008	Gloucester	Essex	13	30,273
Braintree	Norfolk	20	33,828	Goshen	Hampshire	3	921
Brewster	Barnstable	27	10,094	Gosnold	Dukes	27	86
Bridgewater	Plymouth	22	25,185	Grafton	Worcester	8	14,894
Brimfield	Hampden	5	3,339	Granby	Hampshire	3	6,132
Brockton	Plymouth	22	94,304	Granville	Hampden	4	1,521
Brookfield	Worcester	5	3,051	Great Barrington	Berkshire	1	7,527
Brookline	Norfolk	19	57,107	Greenfield	Franklin	2	18,168
Buckland	Franklin	2	1,991	Groton	Middlesex	9	9,547
Burlington	Middlesex	15	22,876	Groveland	Essex	12	6,038
Cambridge	Middlesex	17	101,355	Hadley	Hampshire	3	4,793
Canton	Norfolk	20	20,775	Halifax	Plymouth	23	7,500
Carlisle	Middlesex	15	4,717	Hamilton	Essex	13	8,315
Carver	Plymouth	23	11,163	Hampden	Hampden	4	5,171
Charlemont	Franklin	2	1,358	Hancock	Berkshire	1	721
Charlton	Worcester	5	11,263	Hanover	Plymouth	23	13,164
Chatham	Barnstable	27	6,625	Hanson	Plymouth	23	9,495
Chelmsford	Middlesex	10	33,858	Hardwick	Worcester	9	2,622
Chelsea	Suffolk	19	35,080	Harvard	Worcester	9	5,981
Cheshire	Berkshire	1	3,401	Harwich	Barnstable	27	12,386
Chester	Hampden	21	1,308	Hatfield	Hampshire	3	3,249
Chesterfield	Hampshire	3	1,201	Haverhill	Essex	12	58,969
Chicopee	Hampden	21	54,653	Hawley	Franklin	2	336
Chilmark	Dukes	27	843	Heath	Franklin	2	805
Clarksburg	Berkshire	1	1,686	Hingham	Plymouth	20	19,882
Clinton	Worcester	9	13,435	Hinsdale	Berkshire	1	1,872
Cohasset	Norfolk	20	7,261	Holbrook	Norfolk	22	10,785
Colrain	Franklin	2	1,813	Holden	Worcester	8	15,621

**Population Estimates for Massachusetts Communities, 2000, continued**

TOWN NAME	COUNTY	CHNA	POPULATION	TOWN NAME	COUNTY	CHNA	POPULATION
Holland	Hampden	5	2,407	New Marlborough	Berkshire	1	1,494
Holliston	Middlesex	7	13,801	New Salem	Franklin	2	929
Holyoke	Hampden	21	39,838	Newbury	Essex	12	6,717
Hopedale	Worcester	6	5,907	Newburyport	Essex	12	17,189
Hopkinton	Middlesex	7	13,346	Newton	Middlesex	18	83,829
Hubbardston	Worcester	9	3,909	Norfolk	Norfolk	7	10,460
Hudson	Middlesex	7	18,113	North Adams	Berkshire	1	14,681
Hull	Plymouth	20	11,050	North Andover	Essex	11	27,202
Huntington	Hampshire	21	2,174	North Attleboro	Bristol	24	27,143
Ipswich	Essex	13	12,987	North Brookfield	Worcester	5	4,683
Kingston	Plymouth	23	11,780	North Reading	Middlesex	16	13,837
Lakeville	Plymouth	24	9,821	Northampton	Hampshire	3	28,978
Lancaster	Worcester	9	7,380	Northborough	Worcester	7	14,013
Lanesborough	Berkshire	1	2,990	Northbridge	Worcester	6	13,182
Lawrence	Essex	11	72,043	Northfield	Franklin	2	2,951
Lee	Berkshire	1	5,985	Norton	Bristol	24	18,036
Leicester	Worcester	8	10,471	Norwell	Plymouth	20	9,765
Lenox	Berkshire	1	5,077	Norwood	Norfolk	20	28,587
Leominster	Worcester	9	41,303	Oak Bluffs	Dukes	27	3,713
Leverett	Franklin	2	1,663	Oakham	Worcester	9	1,673
Lexington	Middlesex	15	30,355	Orange	Franklin	2	7,518
Leyden	Franklin	2	772	Orleans	Barnstable	27	6,341
Lincoln	Middlesex	15	8,056	Otis	Berkshire	1	1,365
Littleton	Middlesex	15	8,184	Oxford	Worcester	5	13,352
Longmeadow	Hampden	4	15,633	Palmer	Hampden	4	12,497
Lowell	Middlesex	10	105,167	Paxton	Worcester	8	4,386
Ludlow	Hampden	21	21,209	Peabody	Essex	14	48,129
Lunenburg	Worcester	9	9,401	Pelham	Hampshire	3	1,403
Lynn	Essex	14	89,050	Pembroke	Plymouth	23	16,927
Lynnfield	Essex	14	11,542	Pepperell	Middlesex	9	11,142
Malden	Middlesex	16	56,340	Peru	Berkshire	1	821
Manchester	Essex	13	5,228	Petersham	Worcester	2	1,180
Mansfield	Bristol	24	22,414	Phillipston	Worcester	2	1,621
Marblehead	Essex	14	20,377	Pittsfield	Berkshire	1	45,793
Marion	Plymouth	26	5,123	Plainfield	Hampshire	3	589
Marlborough	Middlesex	7	36,255	Plainville	Norfolk	7	7,683
Marshfield	Plymouth	23	24,324	Plymouth	Plymouth	23	51,701
Mashpee	Barnstable	27	12,946	Plympton	Plymouth	23	2,637
Mattapoisett	Plymouth	26	6,268	Princeton	Worcester	9	3,353
Maynard	Middlesex	7	10,433	Provincetown	Barnstable	27	3,431
Medfield	Norfolk	7	12,273	Quincy	Norfolk	20	88,025
Medford	Middlesex	16	55,765	Randolph	Norfolk	20	30,963
Medway	Norfolk	6	12,448	Raynham	Bristol	24	11,739
Melrose	Middlesex	16	27,134	Reading	Middlesex	16	23,708
Mendon	Worcester	6	5,286	Rehoboth	Bristol	24	10,172
Merrimac	Essex	12	6,138	Revere	Suffolk	19	47,283
Methuen	Essex	11	43,789	Richmond	Berkshire	1	1,604
Middleborough	Plymouth	24	19,941	Rochester	Plymouth	26	4,581
Middlefield	Hampshire	3	542	Rockland	Plymouth	23	17,670
Middleton	Essex	11	7,744	Rockport	Essex	13	7,767
Milford	Worcester	6	26,799	Rowe	Franklin	2	351
Millbury	Worcester	8	12,784	Rowley	Essex	12	5,500
Millis	Norfolk	7	7,902	Royalston	Worcester	2	1,254
Millville	Worcester	6	2,724	Russell	Hampden	4	1,657
Milton	Norfolk	20	26,062	Rutland	Worcester	9	6,353
Monroe	Franklin	2	93	Salem	Essex	14	40,407
Monson	Hampden	4	8,359	Salisbury	Essex	12	7,827
Montague	Franklin	2	8,489	Sandisfield	Berkshire	1	824
Monterey	Berkshire	1	934	Sandwich	Barnstable	27	20,136
Montgomery	Hampden	4	654	Saugus	Essex	14	26,078
Mt. Washington	Berkshire	1	130	Savoy	Berkshire	1	705
Nahant	Essex	14	3,632	Scituate	Plymouth	20	17,863
Nantucket	Nantucket	27	9,520	Seekonk	Bristol	24	13,425
Natick	Middlesex	7	32,170	Sharon	Norfolk	20	17,408
Needham	Norfolk	18	28,911	Sheffield	Berkshire	1	3,335
New Ashford	Berkshire	1	247	Shelburne	Franklin	2	2,058
New Bedford	Bristol	26	93,768	Sherborn	Middlesex	7	4,200
New Braintree	Worcester	9	927	Shirley	Middlesex	9	6,373

**Population Estimates for Massachusetts Communities, 2000, continued**

TOWN NAME	COUNTY	CHNA	POPULATION	TOWN NAME	COUNTY	CHNA	POPULATION
Shrewsbury	Worcester	8	31,640	Warwick	Franklin	2	750
Shutesbury	Franklin	2	1,810	Washington	Berkshire	1	544
Somerset	Bristol	25	18,234	Watertown	Middlesex	17	32,986
Somerville	Middlesex	17	77,478	Wayland	Middlesex	7	13,100
South Hadley	Hampshire	3	17,196	Webster	Worcester	5	16,415
Southampton	Hampshire	3	5,387	Wellesley	Norfolk	18	26,613
Southborough	Worcester	7	8,781	Wellfleet	Barnstable	27	2,749
Southbridge	Worcester	5	17,214	Wendell	Franklin	2	986
Southwick	Hampden	4	8,835	Wenham	Essex	13	4,440
Spencer	Worcester	5	11,691	West Boylston	Worcester	8	7,481
Springfield	Hampden	4	152,082	West Bridgewater	Plymouth	22	6,634
Sterling	Worcester	9	7,257	West Brookfield	Worcester	5	3,804
Stockbridge	Berkshire	1	2,276	West Newbury	Essex	12	4,149
Stoneham	Middlesex	16	22,219	West Springfield	Hampden	4	27,899
Stoughton	Norfolk	22	27,149	West Stockbridge	Berkshire	1	1,416
Stow	Middlesex	7	5,902	West Tisbury	Dukes	27	2,467
Sturbridge	Worcester	5	7,837	Westborough	Worcester	7	17,997
Sudbury	Middlesex	7	16,841	Westfield	Hampden	21	40,072
Sunderland	Franklin	2	3,777	Westford	Middlesex	10	20,754
Sutton	Worcester	6	8,250	Westhampton	Hampshire	3	1,468
Swampscott	Essex	14	14,412	Westminster	Worcester	9	6,907
Swansea	Bristol	25	15,901	Weston	Middlesex	18	11,469
Taunton	Bristol	24	55,976	Westport	Bristol	25	14,183
Templeton	Worcester	9	6,799	Westwood	Norfolk	18	14,117
Tewksbury	Middlesex	10	28,851	Weymouth	Norfolk	20	53,988
Tisbury	Dukes	27	3,755	Whately	Franklin	2	1,573
Tolland	Hampden	4	426	Whitman	Plymouth	22	13,882
Topsfield	Essex	13	6,141	Wilbraham	Hampden	4	13,473
Townsend	Middlesex	9	9,198	Williamsburg	Hampshire	3	2,427
Truro	Barnstable	27	2,087	Williamstown	Berkshire	1	8,424
Tyngsborough	Middlesex	10	11,081	Wilmington	Middlesex	15	21,363
Tyringham	Berkshire	1	350	Winchendon	Worcester	9	9,611
Upton	Worcester	6	5,642	Winchester	Middlesex	15	20,810
Uxbridge	Worcester	6	11,156	Windsor	Berkshire	1	875
Wakefield	Middlesex	16	24,804	Winthrop	Suffolk	19	18,303
Wales	Hampden	5	1,737	Woburn	Middlesex	15	37,258
Walpole	Norfolk	7	22,824	Worcester	Worcester	8	172,648
Waltham	Middlesex	18	59,226	Worthington	Hampshire	3	1,270
Ware	Hampshire	3	9,707	Wrentham	Norfolk	7	10,554
Wareham	Plymouth	26	20,335	Yarmouth	Barnstable	27	24,807
Warren	Worcester	5	4,776				

1. Massachusetts Department of Public Health (DPH) Race-Allocated Census 2000 Estimates (MRACE), released January, 2002.

**Population Estimates for Massachusetts  
Community Health Network Areas (CHNA) and Counties, 2000<sup>1</sup>**

CHNA	POPULATION	COUNTY	POPULATION
1. Community Health Network of Berkshire County	134,953	Barnstable	222,230
2. Upper Valley Health Web (Franklin County)	86,889	Berkshire	134,953
3. Partnership for Health in Hampshire County (Northampton)	150,077	Bristol	534,678
4. The Community Health Connection (Springfield)	291,665	Dukes	14,987
5. Community Health Network of Southern Worcester County	113,702	Essex	723,419
6. Community Partners for Health (Milford)	152,117	Franklin	71,535
7. Community Health Network of Greater Metro West (Framingham)	374,478	Hampden	456,228
8. Community Wellness Coalition (Worcester)	289,834	Hampshire	152,251
9. Fitchburg/Gardner Community Health Network	250,362	Middlesex	1,465,396
10. Greater Lowell Community Health Network	270,083	Nantucket	9,520
11. Greater Lawrence Community Health Network	182,025	Norfolk	650,308
12. Greater Haverhill Community Health Network	144,275	Plymouth	472,822
13. Community Health Network North (Beverly/Gloucester)	118,280	Suffolk	689,807
14. North Shore Community Health Network	278,839	Worcester	750,963
15. Greater Woburn/Concord/Littleton Community Health Network	208,406		
16. North Suburban Health Alliance (Medford/Malden/Melrose)	261,844	<b>STATE</b>	<b>6,349,097</b>
17. Greater Cambridge/Somerville Community Health Network	278,402		
18. West Suburban Health Network (Newton/Waltham)	253,187		
19. Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	746,914		
20. Blue Hills Community Health Alliance (Greater Quincy)	365,457		
21. Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	159,254		
22. Greater Brockton Community Health Network	232,260		
23. South Shore Community Partners in Prevention (Plymouth)	180,609		
24. Greater Attleboro-Taunton Health & Education Response	242,659		
25. Partners for a Healthier Community (Fall River)	140,256		
26. Greater New Bedford Health & Human Services Coalition	195,533		
27. Cape and Islands Community Health Network	246,737		

1. Massachusetts Department of Public Health (DPH) Race-Allocated Census 2000 Estimates (MRACE), released January, 2002.



## GLOSSARY

### Adequacy of Prenatal Care Utilization (APNCU) Index

The Adequacy of Prenatal Care Utilization Index, developed by Dr. Milton Kotelchuck, is the measure used in this publication to classify the adequacy of prenatal care received by Massachusetts resident mothers. *(Please note: beginning with last year's publication, the Kessner Index was used to measure adequacy of prenatal care; please see definition for Kessner Index below.)* The APNCU Index has five categories (adequate intensive, adequate basic, intermediate, inadequate, and unknown), based on the month of pregnancy in which prenatal care begins and the percent of expected prenatal care visits for the time period during which a woman receives prenatal care services. Please see Technical Notes for more details.

### Birthweight

The weight of an infant recorded at the time of delivery. It may be recorded in either pounds/ounces or grams. If recorded in pounds/ounces, it is converted to grams for use in this report.

1 pound = 453.6 grams

1,000 grams = 2 pounds and 3 ounces

### Birthweight Categories

Normal birthweight (NBW):	An infant's weight of 2,500 grams (approximately 5.5 pounds) or more recorded at birth.
Low birthweight (LBW):	An infant's weight of less than 2,500 grams (5.5 pounds) recorded at birth.
Very low birthweight (VLBW):	An infant's weight of less than 1,500 grams (3.3 pounds) recorded at birth.

### Cesarean Section or C-Section

Primary: A mother's first Cesarean section delivery.

Repeat: A Cesarean delivery that has been preceded by at least one Cesarean delivery.

### Community Health Network Areas (CHNAs)

The Department of Public Health, in collaboration with health service providers, coalition members, and interested citizens, has designated 27 areas for community health planning. It is the Department's intention to foster in each of these areas the development of Community Health Networks -- consortia of health care providers, human service agencies, schools, churches, youth, parents, elders, advocacy groups, and individual consumers -- to address the health needs of the community. These community coalitions will participate in monitoring outcomes and progress of strategies and responses to those health needs.

It is hoped the Networks will mobilize around key health issues impacting the community, promote prevention efforts, enhance access to care, provide opportunities for more collaboration among agencies, and create a client-centered, outcome-oriented health service delivery system. Community Health Networks will also promote efficiency in service delivery by working to reduce duplication and overlap, and by identifying gaps in service.

### Community Health Network Areas (cont.)

A Community Health Network Area (CHNA) is defined as an aggregation of cities and towns. In the current publication, we have presented some data by CHNA. To determine which cities and towns make up a particular CHNA, the table on pages 128-130 provides the appropriate CHNA code for each city and town.

The data published in this volume reflect the definitions of CHNAs instituted in January 1997 and the corresponding CHNA names.

### Confidence Intervals

The confidence interval (CI) for the infant mortality rate (IMR) is a range of values that has a 95% chance of including the underlying risk of an infant death. Observed rates are subject to statistical variation; even if the underlying risk of infant death is identical in two subpopulations, the observed IMRs for the subpopulations may differ because of random variation. The confidence interval describes the precision of observed IMR as an estimate of the underlying risk of infant death, with a wider interval indicating less certainty about this estimate. The width of the interval reflects the size of the subpopulation and the number of infant deaths; smaller subpopulations with fewer infant deaths lead to wider confidence intervals.

### Ethnicity

See the section in the Technical Notes of the Appendix entitled: "Changes in the Collection of Race and Ethnicity Information."

### Fetal Death

A stillbirth delivered, extracted or expelled, at 20 weeks gestation or more and / or weighs 350 grams or more.

### Healthy Start

A Massachusetts-funded program providing services and financing for prenatal care to low-income pregnant women who lack health insurance, but do not qualify for Medicaid.

### Infant

A child whose age is less than one year (365 days).

### Infant Death

Death of a child whose age is less than one year.

### Kessner Index (Adequacy of Prenatal Care)

A measure of adequacy of prenatal care, used in *Advance Data: Births* and *Massachusetts Births* publications prior to 2001. The Kessner Index classifies prenatal care as one of 5 categories (adequate, intermediate, inadequate, no prenatal care, and unknown), based on the trimester in which prenatal care began and the number of prenatal visits. The classification adjusts for gestational age to allow for proper classification of premature births, and is as follows:

Category	Trimester Care Began	Number of Visits
Adequate	1	9 or more
Intermediate	1	5-8
	2	5 or more
Inadequate	1	1-4
	2	1-4
	3	1 or more
No prenatal care	--	0
Unknown	Unknown	Unknown

### Live Birth

A live birth is any infant who breathes or shows any other evidence of life (such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles) after separation from the mother's uterus, regardless of the duration of gestation.

### Low Birthweight (LBW)

See Birthweight Categories.

### Maternal Death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes.

### Mother's Birthplace

In this publication, birth characteristics are presented according to mother's birthplace: those who were born in the 50 states and District of Columbia, or "U.S. States / D.C."; those who were born in Puerto Rico, the US Virgin Islands, and Guam, or "Puerto Rico/U.S. Territories"; and those who were born outside of the U.S. and Puerto Rico/U.S. territories, or "Non-U.S.-Born".

### Neonatal

Infants under 28 days of age.

### Neonatal Death

Death of a child whose age is less than 28 days.

### Non-U.S.-Born Women

See Mother's Birthplace.

#### Occurrence Birth

A birth occurring in the Commonwealth of Massachusetts, regardless of the residency of the mother. For individual cities/towns, an occurrence birth represents any birth occurring in that city/town, regardless of the residence of the mother. See Resident Birth.

#### Parity

The total number of live infants ever born to a woman, including the current birth.

#### Perinatal

Referring to the time period immediately before and after birth.

#### Perinatal Death

Death to a fetus of 28 weeks gestation or older or a live-born infant less than 7 days old.

#### Plurality

The number of births to a woman produced in the same gestational period. A singleton is the birth of one infant; twins represent the births of two infants, etc.

#### Post Neonatal

A child whose age is at least 28 days, but less than one year.

#### Post Neonatal Death

Death of a child whose age is at least 28 days, but less than one year.

#### Prenatal Care Source of Payment

Categories used in this publication include:

*Public* = Government programs including Commonwealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care;

*Private* = Commercial indemnity plan, commercial managed care (HMO, PPO, IPP, IPA, and other), or other private insurance;

*Other* = Worker's Compensation and other sources;

*Self-paid*.

#### Pregnancy-Associated Death

The death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause.

#### Race

See the section in the Technical Notes in the Appendix entitled: "Changes in the Collection of Race and Ethnicity Information."

### Resident Birth

The birth of an infant whose mother reports that her usual place of residence is in Massachusetts. In Massachusetts, a resident is a person with a permanent address in one of the 351 cities or towns. Vital statistics data may be presented in terms either of residence or occurrence. All data in this publication, except all data in Tables 22, 23, 24, and selected data in Table 25 are resident data. Resident data include all events that occur to residents of the Commonwealth, wherever they occur. Occurrence data include all events that occur within the state, whether to residents or nonresidents. There is an exchange agreement among the 50 states, District of Columbia, Puerto Rico, Virgin Islands, Guam, and Canada that provides for exchange of copies of birth and death records. These records are used for statistical purposes only, and allow each state or province to track the births and deaths of its residents.

### Vaginal Birth After Cesarean (VBAC)

A vaginal delivery of an infant to a mother who has had at least one prior Cesarean section delivery.

Very Low Birthweight (VLBW) -- See Birthweight Categories.

# Massachusetts Birth Certificate: 2002

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AS REQUIRED BY GEN. LAWS, CHAP. 66, SECT. 4



The Commonwealth of Massachusetts  
DEPARTMENT OF PUBLIC HEALTH  
REGISTRY OF VITAL RECORDS AND STATISTICS  
STANDARD CERTIFICATE OF LIVE BIRTH

STATE USE ONLY

1. RECORD NUMBER  <b>768283</b> 1A. CERTIFICATE NUMBER (DPH USE ONLY)	C H I L D	3C. CITY/TOWN	3B. COUNTY		3A. FACILITY NAME-IF NOT IN FACILITY, NUMBER AND STREET		3D. REGISTERED NUMBER			
2. FACILITY NUMBER		NAME	4A. FIRST	4B. MIDDLE	4C. LAST	5. SEX	6A. PLURALITY	6B. BIRTH ORDER	7. TIME	8. DATE OF BIRTH (Month, Day, Year)
22A. SOCIAL SECURITY CARD	C E R T I F I E R	9A. NAME					9B. TITLE			
		9C. CERTIFIER TYPE					9D. LICENSE NUMBER			
		9E. NUMBER AND STREET			9F. CITY/TOWN		9G. STATE		9H. ZIP CODE	
		NAME		10A. FIRST	10B. MIDDLE	10C. LAST	10D. MAIDEN SURNAME			
INITIALS	M O T H E R	BIRTHPLACE		11A. CITY/TOWN	11B. STATE/COUNTRY			12. DATE OF BIRTH (Month, Day, Year)		
		RESIDENCE (Do not use mailing address)		13A. NUMBER AND STREET		13B. CITY/TOWN		13C. COUNTY	13D. STATE	13E. ZIP CODE
22B. RESIDENT COPY	F A T H E R	NAME		14A. FIRST	14B. MIDDLE		14C. LAST			
		BIRTHPLACE		15A. CITY/TOWN	15B. STATE/COUNTRY			16. DATE OF BIRTH (Month, Day, Year)		
INITIALS	I N F O R M A N T	17A. I (WE) CERTIFY THAT THE PERSONAL INFORMATION APPEARING ABOVE IS TRUE AND CORRECT.							17B. RELATIONSHIP TO CHILD	
		17C. DATE SIGNED (Month, Day, Year)		17D. MAILING ADDRESS (If different from item # 13 above)		NUMBER AND STREET		CITY	STATE	ZIP CODE
1. OCCURRENCE	C E R K	18. DATE OF RECORD (Month, Day, Year)			19. SUPPLEMENT FILED (Month, Day, Year)			20. CLERK/REGISTRAR		
		21. DPH USE ONLY								





## *Massachusetts Births 2002 Evaluation Form*

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In an attempt to better serve our users, we are enclosing this evaluation form. Please take the time to complete this questionnaire and return it to the address at the bottom of the page. Thank you.

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Research and Epidemiology Program

Center for Health Information, Statistics, Research and Evaluation

Massachusetts Department of Public Health

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stamp  
here**

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Research and Epidemiology Program  
Center for Health Information, Statistics, Research & Evaluation  
Massachusetts Department of Public Health  
2 Boylston St, 6th floor  
Boston, MA 02116

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